Social comparison in two-person experimental games

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M. Poppe

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SOCIAL COMPARISON IN TWO-PERSON EXPERIMENTAL GAMES

PROEFSCHRIFT
TER VERKRIJGING VAN DE GRAAD VAN
DOCTOR IN DE SOCIALE WETENSCHAPPEN
AAN DE KATHOLIEKE HOGESCHOOL TILBURG
OP GEZAG VAN
DE RECTOR MAGNIFICUS, PROF.DR. J.E.A.M. VAN DIJCK,
IN HET OPENBAAR TE VERDEDIGEN
TEN OVERSTAAN VAN
EEN DOOR HET COLLEGE VAN DECANEN AANGEWEZEN COMMISSIE
IN DE AULA VAN DE HOGESCHOOL
OP DONDERDAG 8 MEI 1980
TE 14.00 UUR

DOOR

MATTHEUS ANTONIUS MARIA POPPE

GEBOREN TE POELDIJK

1980

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Preface

In this dissertation three empirical studies dealing with the explanatory value of social comparison theory, are presented (chapters 3 to 5, inclusive). These chapters are preceded by two introductory chapters on aspects of experimental games and social comparison relevant to the empirical studies, and followed by a chapter continuing the discussion of some results of the empirical studies.

I am grateful to all those who made a contribution to the coming into being of this dissertation.
A great debt of gratitude I owe to my promotor Prof.Dr. J.B. Rijsman for his invaluable scientific and practical stimulation, and to my copromotor Prof.Dr. C.G. McClintock for his hospitality and the opportunities he offered me at U.C.S.B.
Thanks are due to Mrs. V. van Kesteren-Fuller for translating some of the chapters and to Mr. A. Smith-Hardy for correcting others; to Dr. M. Croon and Drs. M. Berger for statistical advice; to M. van Elteren, T. Ginther, J. Pols, K. Post, Drs. J. Syroit and F. Talarowski for acting as experimenters; to Sister Alice for cooperation in the study dealt with in chapter 4, and to all those who participated as subject in one of the experiments.
To Mia Smulders many thanks for the way she gave the manuscript its final appearance.
Especially I am deeply grateful to Elly for her continuous moral and practical support.

STELLINGEN

1. Wanneer mensen zich op een positief gewaardeerde dimensie met een ander vergelijken, dan streven zij niet naar maximalisatie, maar naar optimalisatie van het verschil tussen beiden.

2. De Speltheorie is in de sociale psychologie geen theorie, maar een onderzoeksparadigma.

3. De belangrijke betekenis die Kelley en Thibaut's "Theory of interdependence" heeft voor de analyse van interpersoonlijke relaties, zal nog vergroot worden, wanneer in de theorie ook de "inputs" worden opgenomen van de personen die in de relatie betrokken zijn.

   Kelley, H.H. and Thibaut, J.W. *Interpersonal relations.* New York: Wiley, 1978.

4. Wanneer al de matrixwaarden van een Prisoner's Dilemma Game of een Maximizing Difference Game met een constante worden verhoogd, dan maken coöperatief ingestelden meer C- (coöperatieve) keuzen en competitief ingestelden meer D- (competitieve) keuzen.

5. De relatie attributie - gedrag is minstens zo problematisch als de relatie attitude - gedrag.

6. Vanuit een attributietheoretisch gezichtspunt kan men agressie en altruisme als elkaars tegendeel beschouwen en opnemen in één theorie.

7. De bevinding dat sociale interactie stimulerend werkt op de cognitieve ontwikkeling heeft belangrijke implicaties voor het onderwijs: niet alleen voor degenen die traditioneel worden aangeduid als onderwijs-ontvangenden, maar ook voor degenen die traditioneel worden aangeduid als onderwijs-gevenden.

8. Degenen die hun hond z'n behoefte laten doen in zandbakken en op speelweiden die voor kinderen bestemd zijn, laten op zeer concrete wijze zien schijt aan kinderen te hebben.

(Stellingen behorende bij M. Poppe: Social comparison in two-person experimental games. Tilburg, mei 1980.)

Aan mijn Ouders,
aan Elly en Eddie

CONTENTS

CHAPTER 1

TWO-PERSON EXPERIMENTAL GAMES

1.1. The Prisoner's Dilemma Game

Interdependency is a fundamental characteristic of human relations. It often happens that people make decisions or behave in ways that have consequences for others, as well as for themselves. On some occasions these consequences may be greater than on others. In most cases they will be less severe than in the following anecdote, ascribed to A.W. Tucker, concerning the verdict of an American court:

> "Two suspects are taken into custody and separated. The district attorney is certain that they are guilty of a specific crime, but he does not have adequate evidence to convict them at a trial. He points out to each prisoner that each has two alternatives: to confess to the crime the police are sure they have done, or not to confess. If they both do not confess, then the district attorney states he will book them on some very minor trumped-up charge such as petty larceny and illegal possession of a weapon, and they will both receive minor punishment; if they both confess they will be prosecuted, but he will recommend less than the most severe sentence; but if one confesses and the other does not, then the confessor will receive lenient treatment for turning state's evidence whereas the latter will get 'the book' slapped at him." (Luce & Raiffa, 1957, p.95)

The problem with which each of the prisoners is confronted can be expressed in the form of a matrix, as in Figure 1-1. In this matrix we have filled in different numbers of months for the prison sentences. It is important to bear in mind that the two prisoners are unable to communicate with one another and that each of them must make his decision without knowing what the other's decision is.

Let us work out what the best solution to this problem would be. If Prisoner 2 does not confess, it would be more "rational" for Prisoner 1 to confess than not to confess. In fact, if Prisoner 1 were to confess, he would be sentenced to 3 months, whereas he would get 12 months if he did not confess.

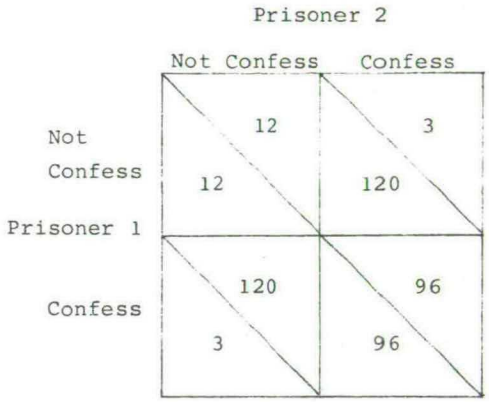


Figure 1-1. Schematic representation of the Prisoner's Dilemma Game. On the left, below each diagonal: no. of months prison sentence for Prisoner 1; to the right and above each diagonal: no. of months prison sentence for Prisoner 2.

Even if Prisoner 2 were to confess it would still be more "rational" for Prisoner 1 to confess, than not to confess, since a sentence of 96 months is preferable to 120 months. This means that, regardless of what Prisoner 2 does, it would be better for Prisoner 1 to confess. According to this same line of reasoning, Prisoner 2 would also do better to confess. But if both of them were to confess, they would both receive sentences of 8 years. So if both of them adopt a rational approach to the problem, then each will receive the worst-but-one possible result in this situation. A much better result would be obtained if neither of them were to confess. But if a prisoner were to choose this option he would have to rely on the other's not confession, either. If, for example, Prisoner 1 did not confess, whereas

Prisoner 2 did, then Prisoner 2 would already be free while Prisoner 1 had barely started his 10-year sentence. This explains why the problem is called the "Prisoner's Dilemma".

It is difficult to advise someone involved in this and similar situations as to what his optimal behavior should be. What can be done, however, is to study, empirically, the kind of decisions that people make in situations of this kind. For practical and, above all, for ethical reasons, one can hardly make use, for this purpose, of the specific circumstances of the district attorney. Therefore situations are usually created in which the decisions are not related to months or years but to "utilities", such as points, or sums of money. An example of this can be seen in Figure 1-2. Matrix (1) in this figure is the abstract form. The symbols in this matrix have the following meanings: R is the Reward for trust, when both make the C-choice. P is the Punishment, when both make the D-choice. T is the Temptation to make the D-choice when one expects the Other to make a C-choice. If the one makes a C-choice while the other makes a D-choice, then one receives the outcome for a Sucker (S). A game qualifies for the name "Prisoner's Dilemma" when, at least, the two following requirements have been met: (a) $S < P < R < T$ and (b) $2R > S + T$. The entries in matrix (2) in Figure 1-2 meet both these requirements.

In a Prisoner's Dilemma Game (PDG) like the one in matrix (2) one can say that both participants can obtain outcomes without one person's outcome being gained at the expense of the other's. There are other types of games in which one person's profit is the other person's loss. These games are therefore called "zero-sum games". Games like the PDG are called "non-zero-sum games" to distinguish them from the other type.

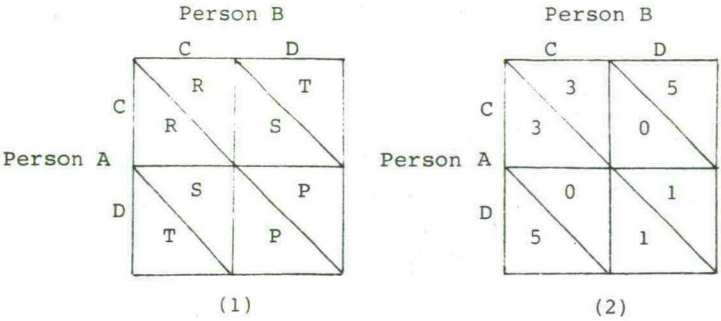


Figure 1-2. PDG matrix (R = reward, S = sucker, T = temptation, P = punishment).

1.2. Game theory

The Prisoner's Dilemma Game has been derived from the Game theory and considerable attention has been given to it in this theory. The word "game" here does not, in the first instance, refer to a certain kind leisure-time occupation for children or adults. Rather, it is applied to every situation involving two or more persons each of whom can make a choice between two or more alternatives which all have consequences for every person concerned. Gallo and McClintock (1965) define a game as "a situation in which the persons involved are attempting to attain some goal(s) and in which their success or failure is dependent not only upon their strategy choices but also upon the strategy choices of the other individual(s) in the situation".
For a game like the PDG the number of participants is restricted to two and the number of alternatives also restricted to two. It is therefore known as a "two-person, two-choice game".

The Game Theory, which was mainly developed by Von Neumann & Morgenstern (1947), is described by Morgenstern (1965, p.65) as follows:

> "The theory of games is a mathematical discipline designed to treat rigourously the question of optimal behavior of participants in games of strategy and to determine the resulting equilibria. In such games each participant is striving for his greatest advantage in situations where the outcome depends not only on his actions alone, nor solely on those of nature, but also on those of other participants whose interests are sometimes opposed, sometimes parallel, to his own. Thus, in games of strategy there is conflict of interest as well as possible cooperation among the participants. There may be uncertainty for each participant because the actions of others may not be known with certainty. Such situations, often of extreme complexity, are found not only in games but also in business, politics, war and other social activities. Therefore, the theory serves to interpret both games themselves and social phenomena with which certain games are strictly identical. The theory is normative in that it aims at giving advice to each player about his optimal behavior; it is descriptive when viewed as a model for analyzing empirically given occurrences. In analyzing games the theory does not assume rational behavior; rather, it attempts to determine what "rational" can mean when an individual is confronted with the problem of optimal behavior in games and equivalent situations."

As we have seen, in connection with the Prisoner's Dilemma Game, it is not possible, in some games, to indicate on a rational basis what the best choice would be. In such situations it is instructive to examine what decisions people do actually make. This is also the case in situations in which the principle of rationality does indicate what the best decisions would be. Here again one can check whether these decisions are, indeed, made. For such purposes research should be carried out along empirical lines.

1.3. Experimental games

When games are considered as a laboratory task, in order to study how people behave in situations of interdependence, one can speak of "experimental games". Since 1955, or thereabouts, experimental games have received the attention of many

investigators in social psychology. A great deal of research has been carried out on the effects of a large number of variables such as strategy, personality characteristics, communication and instructions. It is beyond the scope of this dissertation to describe all the research in this field. For a summary and references see, for example, Guyer & Perkel (1971), Wrightsman, O'Connor & Baker (1972), Křivohlavý (1974) and Pruitt & Kimmel (1977).

Pruitt & Kimmel, in 1977, assessing the results of "twenty years of experimental gaming", make the following observation:

> "Game research has a peculiar status. On the one hand it has been immensely popular, with over 1000 published studies (...). But on the other hand, the results of these studies have been largely ignored by the broader field. Our diagnosis of this situation stresses an undesirable method-bound approach, lacking in theory and with little concern for external validity." (p.63)

The lack of theory in gaming research can hardly be denied. Even in the earliest experiments it soon became apparent that the assumption of own gain maximization derived from mathematics and economics, was not borne out. Game theory has not been modified in social psychology since then, nor has it been replaced by another theory. Instead, "game theory" in social psychology became a label for a certain research paradigm which was, indeed, extremely "method-bound". In many studies only one sort of game was used, namely, the PDG. Later on in this chapter we shall describe how major developments in gaming research have occurred in conjunction with a modification of the matrix.

One of the leading investigators in the field of gaming research, Anatol Rapoport, wrote in the preface of the book "Prisoner's Dilemma" (1965, pp. vi, vii), concerning the application of scientific method to personality, intellect and moral commitment:

> "Typical conclusions are arrived at by applying intricate scaling techniques and sophisticated significance tests to masses of data highly specific to the particular question under investigation. Such conclusions are frequently no

> more revealing than that 'people who score high on test T_1 are somewhat likely to score high on test T_2'. Regardless of whether these results are trivial or dramatic, the fact remains that little has been done to enhance a broad understanding of man from these fragments. The knowledge so gathered remains a catalogue of 'findings'."

This observation seams highly applicable to gaming research. Nineteen years later a 600-page overview of gaming research appeared (Křivohlavý, 1974). This book contains an extensive collection of results. Freund & Marton (1976) in a review, rightly refer to it as "the whole two-person, non-zero-sum game catalogue". The book contains no more than 30 pages on theory. Pruitt and Kimmel (1977), too, apart from their own goal/expectation theory, which specifies the conditions on which PDG participants make a cooperative choice, report only a few, very isolated (mini)theories in the field of gaming research.

The method advocated by Rapoport (1965, p. vii) is as follows:

> "Instead of asking a complicated question (as all psychological important questions must be) and coming up with a very simple answer (often in the form of yes, no, or maybe), one might try asking a very simple question such as 'given a choice between two alternatives, what will a person do?', and derive a rich and complex avalanche of answers."

The collection of data could then be transformed, by mathematical methods, into a purely formal theory which could eventually be interpreted in a psychological way. However, one should realize that the mere decision what alternatives one offers the person to choose from, determines what theory will be (im)possible.

The major function of experimental research in social psychology is to test hypotheses derived from a theory or to contribute, in other ways (heuristic, for example) to the development of a theory. This theory should be of explanatory or predictive value with regard to the phenomena occurring in the reality outside the laboratory. There is little sense in linking results from laboratory research directly (that is,

without the intermediate link of theory) to everyday reality, yet this has repeatedly been done in gaming research. It is not clear whether this has led to the relative lack of theory development, or whether the fact that there is little theory is the reason for the frequent attempts to find a direct link between laboratory research and phenomena in everyday reality. Probably both causes play a role here.

1.4. Kelley & Thibaut's "Theory of Interdependence"

Pruitt & Kimmel, in their 1977 overview, were obviously unable to include Kelley & Thibaut's "Theory of Interdependence" which was published in 1978, in a book entitled "Interpersonal relations". This book represents a further step in the analysis of interpersonal relations published by the authors (Thibaut & Kelley) in 1959.
Thibaut & Kelley adopt as starting point for their analysis the interaction in a dyadic relationship. Interaction can be considered to occur whenever two people "emit behavior in each other's presence and when there is at least the possibility that the actions of each person affect the other". As unit for the analysis of behavior they took "a number of specific motor and verbal acts that exhibit some degree of sequential organization directed toward the attainment of some immediate goal and/or state". This is called a behavior sequence or set.

Every person has a repertoire of sets. An interaction between two persons can be described by means of the items which each of the two selects from his own repertoire. An interaction yields, for the person concerned, outcomes that can be described as the difference between the rewards ("the pleasures, satisfactions and gratifications the person enjoys") minus the costs ("any factors that operate to inhibit or deter the performance of a sequence of behavior"). The rewards and costs can be determined by exogenous and endogenous factors. The former are factors that the person takes with him in every relationship (such as values, needs, skills, tools, predis-

positions) and are thus external to a certain relationship. The latter factors are intrinsic to a certain interaction. "The central point is that the specific values associated with a given item in A's repertoire depend upon the particular item in B's repertoire with which, in the course of interaction, it is paired" (pp. 15-16).

The pairing of items from A's behavioral repertoire with items from B's behavioral repertoire is best visualized by thinking of a matrix in which all the items in A's repertoire constitute the rows, and all the items in B's repertoire, the columns. The cells then represent all the events that could possibly occur in the interaction. One can also indicate, in the cells, the outcomes that the various events yield for the two individuals. These outcomes are (psychologically) scaled with the "comparison level" (CL) as zero point.

> "The CL is the standard against which the participant evaluates the "attractiveness" of the relationship or how satisfactory it is. This is the standard that reflects the quality of outcomes that the participant feels he or she deserves. Outcomes falling above CL are experienced as relatively satisfying and those below CL as unsatisfactory. The location of CL on the person's scale of outcomes is determined by all the outcomes known to the member, either by direct experience or by observation of others. The more attainable an outcome, the heavier it will be weighted in forming the CL." (Thibaut & Kelley, 1978, pp. 8-9).

Outcomes that a person obtains from a relationship may have a negative value, that is, they may be seen as relatively unsatisfactory. Despite this, the person will continue the relationship if no better alternative is available. If a better alternative should be available, then the person will abandon the relationship. The outcomes will then have dropped below the so-called "comparison level for alternatives (CL_{alt})".

If, for the sake of simplicity, the number of items in A and B's repertoires is restricted to two, this will produce an outcome structure of the kind shown in matrix (1) in Figure 1-3. In this matrix the entries indicate the outcomes for each of the two persons, individually.

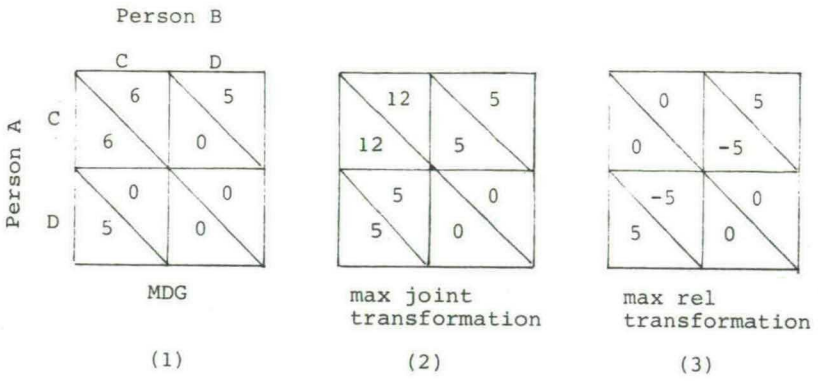


Figure 1-3. Maximizing Difference Game and transformations.

It is possible, however, that Person A and B, faced with a choice between C and D, may be influenced not by their own, independent, outcomes, but by the outcomes that they might obtain jointly, or by how many more outcomes one might obtain than the other. Matrix (1) in Figure 1-3 could then be changed according to a "max joint" (maximization of joint gain) or a "max rel" (maximization of relative gain) transformation into, respectively, matrix (2) and matrix (3) of Figure 1-3. In this way, the matrix "given" by the physical and direct social circumstances is changed into an "effective" matrix by means of a transformation process. According to Kelley & Thibaut (1978, p.19), a transformation process "affords a way of describing important social determinants of behavior (social values and sociotemporal organization of behavior) and of moving from the level of specific behavior to more complex social phenomena such as the interplay of different orientations to social interaction and systems of rules, roles and norms."

Transformations of the matrix make it clear that the matrix is not simply a collection of entries, each of which relates to an outcome, but that it is a question of the pattern of entries

in the matrix. This also finds its expression in the analysis of interpersonal relations in terms of various components. In 1959 Thibaut and Kelley (pp. 102-103) made a distinction between the two forms of control that one person can exercise over another. One form is Fate Control (FC): "By varying his behavior, A can affect B's outcomes regardless of what B does". The other form is Behavior Control (BC): "By varying his behavior, A can make it desirable for B to vary his behavior, too". The degree of interdependence in a relationship is determined by the degree of FC and BC. Person A can change his behavior and this can affect his own outcomes, regardless of what B does. In such a case Kelley and Thibaut (1978, p. 31) speak of Reflexive Control (RC). Besides the three components already mentioned there is also a general level, known as the Grand Mean (GM) of a person's outcomes. The pattern of outcomes of a person in a matrix is composed, in its entirety, of the four components, GM, FC, RC and BC. Chapter 4 of this dissertation goes further into the quantitative aspect of this. The components can be distinguished in both a "given" and a "effective" matrix. The components and the relations between them, in fact, determine the characteristics of an interdependence relationship. Kelley and Thibaut explain this in a highly analytical fashion.

1.5. The minimal social situation

In this paragraph we shall be taking a closer look at the phenomenon of "fate control", using a specific research situation as example. The example, here, is what is known as the "minimal social situation". According to Gallo and McClintock (1965) research into the minimal social situation is one of the historical forerunners of experimental game research. The example serves to indicate how far-reaching an interdependence situation can be. The interdependence in the study in question occurs without either of the persons involved in the interaction being aware of the other's

existence. The study is one of a series of experiments started by Sidowski, Wyckoff & Tabory (1956) and Sidowsky (1957) and further elaborated by Kelley, Thibaut, Radloff and Mundy (1962). We shall describe one experimental situation from this last article.

Two subjects, neither of whom is aware that anyone, beside himself, was participating in the study, are placed in separate rooms. There they find two push-buttons (X and Y) and a counter. They do not know that the two buttons are connected up with the other person's counter. When one subject presses button X, the other subject gets +10 points and when one subject presses button Y, the other gets -10 points. So whenever one subject presses a button, this has consequences for the other subject, although neither is aware of this. The object of the set-up is that each subject presses one of the two buttons every time he receives a signal from the experimenter. In some conditions the arrangement is such that the two persons alternate in pressing the button and in other conditions the persons press the button simultaneously. After 100 to 140 trials the subjects appear to have presses the button awarding the other +10 point on average in 47% of the cases in the first condition, and in 75% of the cases in the latter condition. This difference may seem surprising but can be clearly explained, as Kelley c.s. (1962) demonstrated.

The clue to the explanation lies in the finding from learning theory, namely, that if a person obtains a positive result (reward) directly after 'emitting' a certain behavior, he is likely to repeat that behavior, and that if he obtains a negative result (punishment) after a certain behavior he will not repeat that behavior. Kelley c.s. call this principle "win-stay, lose-change" . If this rule is applied to the situation in which two subjects, A and B, simultaneously make a choice between X and Y, one arrives at the possibilities shown in Figure 1-4. For the first choice, the subjects will select X or Y at random, so that four different combinations occur.

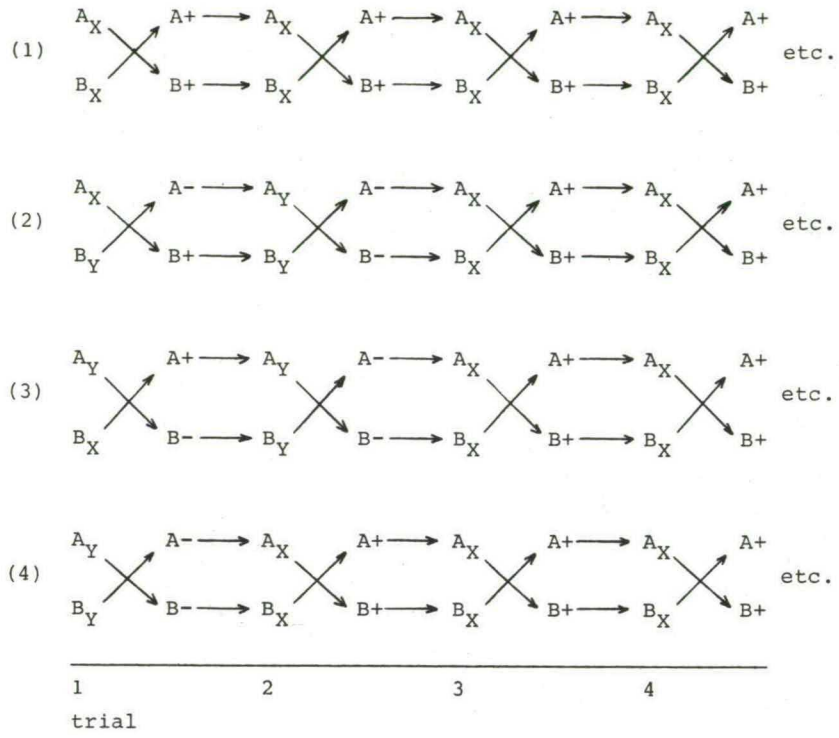


Figure 1-4. Simultaneous response sequences in minimal social situation.

According to the "win-stay, lose-change" principle, each of these combinations will lead, within three trials, to a chain of X-choices. In the condition in which A and B alternately choose between X and Y, things will turn out differently, as can be seen in Figure 1-5. The case in this situation is such that only if both A and B happen to choose X on the first trial will the sequence lead to a stable series of exclusively X-choices, according to the "win-stay, lose-change" principle.

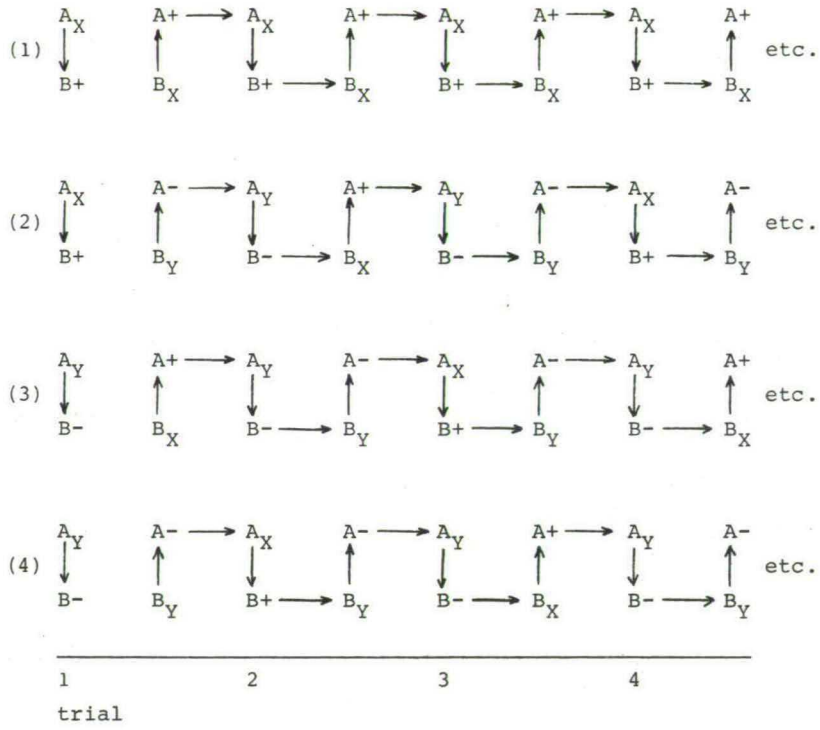


Figure 1-5. Alternating response sequence in minimal social situation.

If any other combination than XX is chosen, in the first trial, then mixed X and Y choices will persist. In this way the simple "win-stay, lose-change" rule can be used to explain why more favorable (for the Other) choices are made in a simultaneous-choice sequence than in an alternating-choice sequence. Incidentally, this example raises a number of questions concerning "Fate Control". By exercising Fate Control Person A affects the outcomes that B receives and hence, also, B's behavior. As Thibaut & Kelley (1959, p. 104) observed, an

implicit conversion of Fate Control to Behavior Control has occurred.

1.6. Motives and matrices

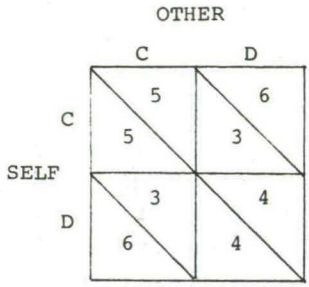
The "win-stay, lose-change " principle of the minimal social situation is consonant with what is taken as starting point for the normative Game theory: people attempt to maximize their outcomes. It appears, from research into experimental games, that this motive is not the only one operating in decision situations involving two people. McClintock & McNeel (1966 a, b, c, d, 1967) suggested the possibility of two other motives besides that of maximizing one's own gain (individualism), namely, a motive to maximize joint gain (cooperation) and a motive to attain as many more outcomes as the Other, as possible (competition). In a PDG (see matrix (2) in Figure 1-2) cooperation will lead to a C-choice. A D-choice in a PDG, however, can be determined by either individualism or competition. In order to make a distinction between individualism and competition, McClintock & McNeel created a new sort of game, namely, the Maximizing Difference Game (MDG). An example of a MDG can be found in matrix (1) in Figure 1-3. In a MDG both individualism and cooperation lead to a C-choice. A D-choice in this type of game indicates competition. Thus, in a PDG it is possible to establish cooperation unequivocally, and in a MDG competition can be unequivocally established. Individualism, moreover, is seen as an immediate maximization of own gain. As we have seen, in paragraph 1.1, a person whose long-term strategy in a PDG, is to maximize his gain, will attempt to secure a C-choice by both participants. McClintock & McNeel (1966 a, b, c, d, 1967) found that, in studies with a MDG, in general, a considerable percentage of the choices were D-choices. Naturally, this percentage is dependent on a variety of factors, such as feedback of outcomes and the value of the units in the matrix. One can say, however, that, in general, competition has some effect on the choosing behavior in an

experimental game.

It will be evident, from the above, that the kind of matrix determines which motives will be associated with a particular choice. Moreover, the relation between choice and motive in a PDG and MDG is no unambiguous one. In a PDG, for instance, one can make a D-choice to obtain the "Temptation" pay off (see matrix (1), Figure 1-2) or to avoid the "Sucker" pay off. A particular choice can also be a strategic one, that is, one designed to elicit certain behavior from the Other. Pruitt (1967) and Messick & McClintock (1968) described another form of game by means of which one can determine, unequivocally, which motives lead to a certain choice. This form is known as a 'decomposed' game. In a decomposed game each of two persons, is presented, separately, with two (or more) alternatives. Each alternative yields a number of units for the Chooser and for the Other. Each of the two receives units on the basis of his own choice and on the basis of Other's choice. Figure 1-6 contains two examples. One can see that maximization of Joint gain (cooperation) leads to the choices of alternative C and that maximization of Own gain (individualism) and maximization of Relative gain (competition) will both lead to the choice of alternative D. The structure of a PDG can be recognized, here. Combinations of C and/or D-choices by the two persons lead to the pay offs shown as matrix-entries in PDG matrix (2). As can be seen from matrices (3) and (4) of Figure 1-6, there is the same relation between the decomposed and non-decomposed form of a MDG as between that of a decomposed and non-decomposed PDG. Apart from a PDG and MDG one can also create other types of two-choice decomposed games. The number of alternatives for a decomposed game can be extended without presenting many problems. This enables one to study other motives, besides individualism, cooperation and competition. This was done in a study by McClintock, Messick, Kuhlman & Campos (1973).

	Choice	
	C	D
SELF	3	4
OTHER	2	0

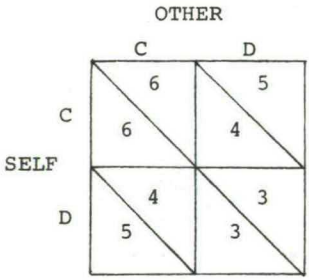
(1) Decomposed PDG



(2) PDG

	Choice	
	C	D
SELF	4	3
OTHER	2	0

(3) Decomposed MDG



(4) MDG

Figure 1-6. Decomposed and non-decomposed PDG and MDG.

With the aid of a number of three-choice decomposed games, they considered whether it was worthwhile distinguishing aggression as a motive (minimization of Other's gain), in addition to the three motives already mentioned. The alternatives which exclusively indicated the aggression motive were not chosen any more often than alternatives that were not based on any particular motive. Therefore it seemed rather pointless, in this study, to distinguish aggression as a motive.

Kuhlman & Marshello (1975a, b) confronted subjects with a number of three-choice decomposed games of various types. If a subject, in the various types of games, fairly consistently chose the alternatives belonging to a certain motive, he was classified as having this motive as his dominant motive. In this way most of the subjects could be classified as being predominantly individualistically, cooperatively or competitively oriented. From a further analysis of the choices of those subjects who had not chosen consistently, according to one of these three motives, it appeared that the choices of a number of subjects had been consistently altruistic (maximization of Other's gain). This is also proved to be the case in a study by Kuhlman & Wimberley (1976).

In the studies and analyses reported it was concluded, in each case, on the basis of certain choices from two or more alternatives that a particular motive was present (to a certain extent). But this still fails to provide any insight into the relations between the motives. Griesinger & Livingston (1973) and McClintock (1972, 1976) developed a spatial model of social motives. This model consists of a horizontal and a vertical axis representing, respectively, the outcomes for the Chooser and the outcomes for the Other (see figure 1-7). People's motives can then be represented as vectors in this space. Individualism (maximizing Own gain) can be thought of as a vector along the horizontal axis, altruism (maximizing Other's gain) and aggression (minimizing Other's gain) as two vectors, running in opposite directions along the vertical axis. Cooperation (maximizing Joint gain) can be imagined as the vector dividing the upper right quadrant in two and competition (maximizing Relative gain to Own advantage) as the vector dividing the lower right quadrant.

A person's preferences for a particular alternative is determined by the projection of that point on that person's motivation vector.

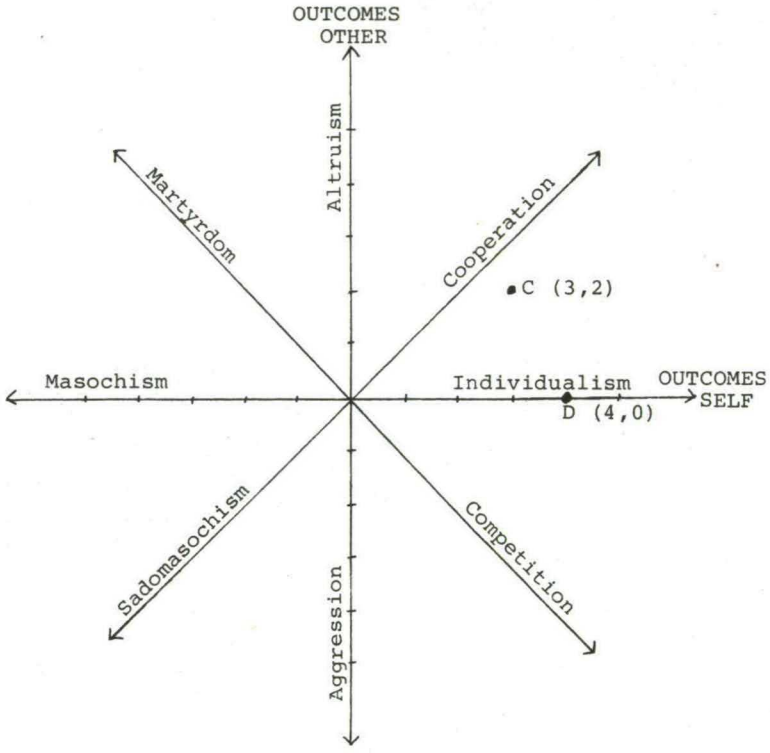


Figure 1-7. Two-dimensional motivational vector space.

In figure 1-7 the two alternatives of the decomposed PDG in matrix (1) of Figure 1-6 are shown in the motivational space. Clearly, alternative C has a greater projection on the cooperation (and on the altruism) vector and alternative D a greater projection on the individualism and competition (and

aggression) vector.

Three further vectors have also been included in Figure 1-7, namely, maximizing relative gain to Other's advantage (martyrdom), minimizing Own gain (masochism) and minimizing Joint gain (sadomasochism). Incidentally, the number of possible motives is still not exhausted. MacCrimmon & Messick (1976) distinguished further motives, including equalitarianism (choosing so as to make your pay off and the other's pay off more equal), proportionate competition (choosing so as to increase the ratio of your pay off to the other's pay off) and proportionate cooperation (choosing so as to increase the product of your pay off and the other's pay off). These last motives cannot be expressed as vectors in the two-dimensional space of Figure 1-7.

The motives reported are, to a considerable degree, descriptive in character. This can occasionally lead to uncertainty. As an example we shall describe an experiment by Messé, Dawson and Lane (1973). The subjects in this experiment had volunteered to take part in "motivational research" for pay. Half of the subjects made ten choices in a PDG with the values R = $.04, T = $.06, S = $.01 and P = $.02 (cf. matrix (1), Figure 1-2). The other half made ten choices in a PDG with values that were ten times higher. Independently of this distribution, half of the subjects first performed a certain task for about one and a half hours before making the PDG choices, while the other half started on the PDG choices immediately. It appeared that, in the low-reward condition, the subjects made the cooperative choice (C) in an average of about 60% of the trials, regardless of whether they had performed a certain task beforehand. In the high-reward condition the percentage of cooperative choices was 81% for those who had previously performed the task and 34% if no prior task had been performed.

In this study one can interpret the C-choices as expressions of the motivation to maximize Joint gain and the D-choices as

maximization of either Own or Relative gain. By doing this, however, one is only describing and one thus fails to penetrate to the core of the motivational processes. As Messé, Dawson and Lane report, one can consider the subject's choices as having been made to obtain an equitable payment. According to the equity motive, people desire outcomes which are proportional to their inputs (such as time, effort, etc.). A person establishes this proportion by comparing his inputs and outcomes with those of a certain standard. This may be a certain norm or it may be a person with whom one compares oneself in terms of inputs and outcomes (cf. Adams, 1965; Walster, Berscheid and Walster, 1973).

The subjects who have already spent 1½ hours performing a task can obtain an equitable reward for the time and effort they have invested, in the high-reward condition. If the subjects who had started on the PDG immediately had chosen C on a great many trials in the high-reward condition, they would have received a reward that was relatively high in comparison with the time and effort invested. They can restrict the size of the reward by both choosing D. These D-choices could be described as minimization of Joint gain (sadomasochism). The rational described here for the high-reward condition does not apply to the conditions with low rewards. The size of the rewards here is such that they cannot be regarded as a possible recompense for invested time and effort. In the high-reward conditions, in fact, various other motives are used to describe something that can be explained by the equity motive. The same can also be said of a study by Pepitone (1971) and Pepitone et al. (1970). A characteristic of all these studies is that there is a difference in inputs or in outcomes already received at the moment that subjects start to make choices in a game. This is not the case in the majority of PDG and MDG studies.

Since the outcomes preferred by the subject are related to the inputs he has made, it is not possible, in the two-dimensional

vector space of Figure 1-7, to draw in a vector which gives a general representation of the equity motive. The equity vector could, however, be given for a concrete situation, as Van Avermaet, McClintock and Moskowitz (1978) have described. This vector, which passes through the intersection of the two axes, has a slope which is equal to the ratio of Own inputs to Other's inputs. As demonstrated by Van Avermaet c.s. (1978) and by Reiss and Gruzen (1976), equity is not only a motive but can also be used as a strategy. This is the case when the equity rule is used whenever it maximizes Own or Relative gain and another rule (for instance, equality) whenever the latter maximizes Own or Relative gain. It means that the one "motive" can be adopted as a strategy within the framework of another motive.

In view of the, often, purely descriptive character of the motives mentioned here and of the mutual relations between the motives, it seems appropriate to look for an integrated approach to social motivation. In this connection we shall examine, in the following chapters, what possibilities social comparison offers as an explanatory motivational principle. First of all, in chapter 2, we shall describe the theory.

CHAPTER 2

SOCIAL COMPARISON

2.1. Introduction

In this chapter a description of the phenomenon of social comparison will be given. The next paragraph will provide an overview of the major points of a theory of social motivation, as described by Rijsman in a number of very recent publications (1979a, b; in press a, b). The essence of this theory is the way in which an individual experiences himself in relation to others. The social comparison process, that constitutes an important part of the theory, will be further elaborated, in the form of a model, in the next paragraph-but-one. In the final paragraph a few phenomena will be elucidated with the aid of the motivation theory described here.

2.2. Rijsman's theory of social motivation[1)]

In the course of perception a number of processes operate, which enable the perceiver to know reality and to react to it in a meaningful way. A person who, on the basis of a number of stimuli of form, size, color, etc, believes that he is dealing with a table, reduces a large number of stimuli to a cue for something that he calls "table". However, he can only speak of a "table" when the object displays some similarity to other objects called "table". But in order to say something about a particular table, it is, at the same time, necessary for the object in question to differentiate itself in some way from the other tables. The fact that someone calls a certain object "table" implies that certain behavior in relation to the object

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1) Footnote: The essence of the theory does not differ fundamentally in the four publications by Rijsman mentioned. The publications do differ, however, in the depth at which certain points are discussed. References here are to the publication which deals with the point in question at the greatest length.

will be more probable and other behavior less probable. The concept "table" implies a number of action tendencies. If another perceiver considers the object as something else (a bed, for instance) and displays other action tendencies in relation to the object, problems will arise. For in such a case the actions related to the object will be difficult to coordinate. The problem can be solved if one of the perceivers changes his behavioral intentions (and thus gives the object an other significance). One of the perceivers could also ignore the other and could coordinate his ascription of meaning and his behavioral intentions with those of other perceivers (where possible).

As Rijsman (1979b, pp. 288-289) describes, these processes are not only involved in the perception of, for instance, physical objects, but are of equal importance to the way in which an individual experiences himself in relation to others. The behavior prompted by this experiencing is what we call "social behavior". This is because it is related to social reality, that is to say the reality that consists, from the viewpoint of the individual, of himself and beings-like-himself ("socii").

In Rijsman's analysis (1979b) of the Self/Other perception the fundamental principles are defined as:

a. Social attribution. This is the reduction of variable stimuli to a cue for an invariant unit of significance (the person) underlying the stimuli.
b. Social comparison. The unit of significance (the person) subjectively constitutes for the individual, one element in a collection of conceptually similar elements (others-like-himself), in such a way that this one element is at the same time both equated with and distinguished from the other elements.
c. Social validation. The subjective validity value of the significance attributed to a unit depends on the extent to which one's behavioral intention toward that unit can be coordinated with the behavioral intentions of other

perceivers toward the same unit of significance.

Although these principles can be distinguished at the theoretical level, their actual roles in reality cannot be separated. The three principles can be represented in a single diagram. (See Figure 2-1).

From stimuli, the individual (I) derives subjective cues (C_I and C_O) for his own person (P_I) and for the Other (P_O). These cues relate to the behavior and to everything connected with it, that is, not only to deeds and to words but also to the body and to material and cultural symbols such as possessions, clothes, insignia, etc. The individual (I) will not be confronted to the same degree with information stimuli concerning himself and concerning Other.

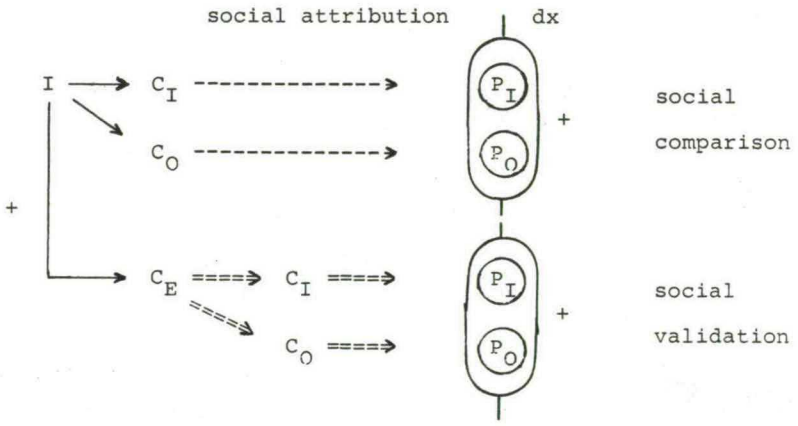

Figure 2-1. Diagram of Self/Other perception according to Rijsman (1979a, b; in press, a, b). See text for explanation.

Thus, he will be confronted with his own proprioceptive (internal) stimuli but not with those of Other. In this respect there is a difference between the individual's standpoint in relation to himself and in relation to the Other. One is dealing with one's own "inside" and with Other's "outside". This difference can be partially reduced if one imitates the Other, or is imitated by him, or if one's "subjective self-awareness" is increased by a confrontation with oneself in a mirror (Duval & Wicklund, 1972). However, the complete abolition of this difference in standpoint is virtually impossible to achieve. Jones and Nisbett (1971) demonstrated that the difference in standpoint affects the process of attribution.

Rijsman (in press, a) uses Kelley's "principle of co-variance" (1967) to explain the way in which an individual concludes, from behavior, that there is an invariant unit of significance (a person) underlying that behavior. A perceiver attributes behavior to the characteristics of a particular person when, in his opinion, that person's behavior differs from that of others in similar circumstances. In order to merit such attribution the difference in behavior must be systematic, that is to say, it must be consistent over time and over perceptual conditions (modality). Rijsman (in press, a) points out that even to be able to attribute behavior to oneself and to be able to experience oneself as a person, a consistent difference between one's own and other's behavior in a certain situation is required. This attempt to identify a consistent behavioral difference is, in fact, part of the process of social comparison.

According to the principle of social comparison, knowledge of oneself as a person entails being similar to others-like-oneself, and, at the same time, differentiating oneself from these Others. The integrative tendency of the social comparison process is expressed in Figure 2-1 by the loop around both P_I and P_O, and the discriminative tendency by the

separate loops around P_I and P_O. In the social comparison process these two tendencies maintain an equilibrium at the point at which the person is slightly different from the Other. The comparison and differentiation are always made in relation to a particular dimension of the person. If the Individual attaches considerable value to this aspect of his person and is thus highly involved in this dimension, this will become an evaluative dimension for him. In view of his involvement, an Individual will always prefer the positive outcome of the comparison with the Other, that is , he will prefer to be slightly better than the Other (this is indicated by "+" in the social comparison portion of Figure 2-1).

As Rijsman concludes, the essence of the social comparison process is the attempt to obtain a slightly superior position, in the comparison of Self with Other(s), on a dimension of comparison of subjectively high value, and to maintain this position. In order to achieve this, there are a number of theoretical possibilities (Rijsman, 1979b, in press, a):

1. Introducing change in the social cues. The individual introduces some change in the behavior, body or possessions of himself and/or the Others, in such a way that the cues for his own person provide a favorable contrast, in the comparison with the Other's(s') cues.
2. Changing the meaning of social cues. This can be done, for instance, by attributing or not attributing cues to a person. An individual can improve his subjective position on an evaluative dimension, in the comparison with the Other, for example, by ascribing a negative result of his own performance to misfortune and a positive result of Other's performance to chance.
3. Choosing a different comparison-Other. For the comparison one can choose someone from whom one can differentiate oneself, in one's own favor.
4. Choosing a different dimension of comparison. As dimension of comparison one can choose that aspect of the Person that

makes a positive outcome for oneself most likely.

All four possibilities may not always be open. The dimension of comparison that is relevant is determined, to a large extent, by, for example, the culture in which one is living. Certain persons may, (because of their physical presence, for instance) be hard to ignore as comparison-Others. In reality, making use of a certain possibility of obtaining or maintaining a positive self-image involves costs (e.g. efforts). These costs will largely determine which mechanisms are to be used.

Rijsman (in press, a) applies the social comparison process not only to single individuals but also to groups of individuals. A certain individual can classify himself, perceptually in (identify himself with) a certain group. This group (the I-group) will try to differentiate itself from other groups in exactly the same way as the single individual attempts to differentiate himself from Others. The individual in the group, in fact, avoids comparison with Others in his own group. But this situation persists only as long as the I-group is being compared with other groups. When the inter-group comparison ceases, intra-group comparison among individuals will occur.

The third (in logical sequence) process that Rijsman describes is that of social validation. An individual (I), by means of social attribution and social comparison, tries to obtain a positive Self-image. He wishes to see his own opinion of his Self-image (i.e. his opinion about the result of the comparison with the Other) confirmed (validated) by an Evaluator. To this end I concludes, from the cues (e.g. reward, criticism) (C_E) that the Evaluator uses to express his assessment, how the Evaluator perceives the social cues (C_I and C_O) and what impression of P_I and P_O he forms on the basis of these cues. I's assessment of himself is validated when the Evaluator allocates to P_I a more favorable position on

dimension dx than to P_O. If such is the case (a "+" in the "social validation" part of Figure 2-1) I will, in turn, reciprocate the Evaluator's positive feelings (a "+" on the left-hand side of Figure 2-1). Should the Evaluator's opinion not coincide with that of I, then I will attempt to alter the Evaluator's assessment by pointing out to him possible "errors" in the perception of cues, the interpretation of cues, the choice of comparison-Others or the choice of dimension of comparison. If this fails and the Evaluator's opinion remains negative, then I will adopt a negative attitude to the Evaluator and will look for an evaluator whose assessment is positive.

The ideas described above correspond to Heider's (1955) balance model. An Individual with a positive Self-image (P_I) will determine his attitude to Other according to Other's assessment of I's Self-image. As Rijsman (in press, a) describes, the attempt to achieve balance and consensus is not a fact, in itself, but provides the basis for "knowing". He considers knowledge of an object as the symbolic translation of the behavioral possibilities toward that object as experienced by the perceiver. If, in a community, there is a communal way of dealing with reality, the need for coordination of behavioral tendencies and, thus, for consensus in knowledge will be felt. If an Individual has a positive image of himself and an Evaluator has a negative image of P_I (in comparison with P_O), the Individual will not be able to reconcile his own rapprochement-orientation to himself with the contrary orientation of the Evaluator and will, consequently, reject the Evaluator.

2.3. A model of social comparison

As explained in the previous paragraph, an Individual (I) is subject to two simultaneous tendencies: to be like an Other, and to differentiate himself from Other, in a positive sense. Certain restrictions apply here. On the one hand, I will never

wish to be completely identical to Other as this would mean the abolition of his own identity (P_I and P_O occupy the same point). For this reason I will aim for the limit of equality, so that P_I and P_O are still, just, distinguishable from one another. On the other hand, in his tendency to be differentiated, I will never wish to fall outside the collection of elements-endowed-with-significance (persons) to which he himself and the comparison-Other both belong.

Bearing this in mind, Rijsman (1979b, in press, b) constructed a model based on a linear scale on dimension dx, of -1 to +1, in which -1 means that I is maximally inferior to Other and +1 that I is maximally superior to Other (within the bounds of comparison). Point 0 indicates complete equality (actually, the limit of complete equality). The tendency to be equal to Other prescribes that the more inferior I is to Other, the more he will try to increase the value of his position (performance, possessions, etc.) and the more superior he is, the more he will try to play down his position. This is expressed in Figure 2-2, by the vectors (a) (the upward vectors indicate the attempt to improve one's relative position, the downward vectors the attempt to weaken one's position in relation to Other). The tendency to differentiate oneself from Other is 0 when P_I is maximally superior and grows stronger as P_I becomes less superior and more inferior in comparison with P_O. This tendency is indicated by vectors (b) in Figure 2-2. As the two tendencies operate simultaneously in an individual, vectors (a) and (b) can be added together.

The sum of (a) + (b) indicates the strength and the direction in which I might attempt to alter his position, should he be maximally inclined to compare himself with the Other. However, this comparing only becomes maximal at the limit of equality of P_I with P_O. The tendency to compare oneself diminishes as P_I and P_O become more dissimilar. This is expressed by the drawn line (c) in Figure 2-2. The sum of the vectors (a + b)

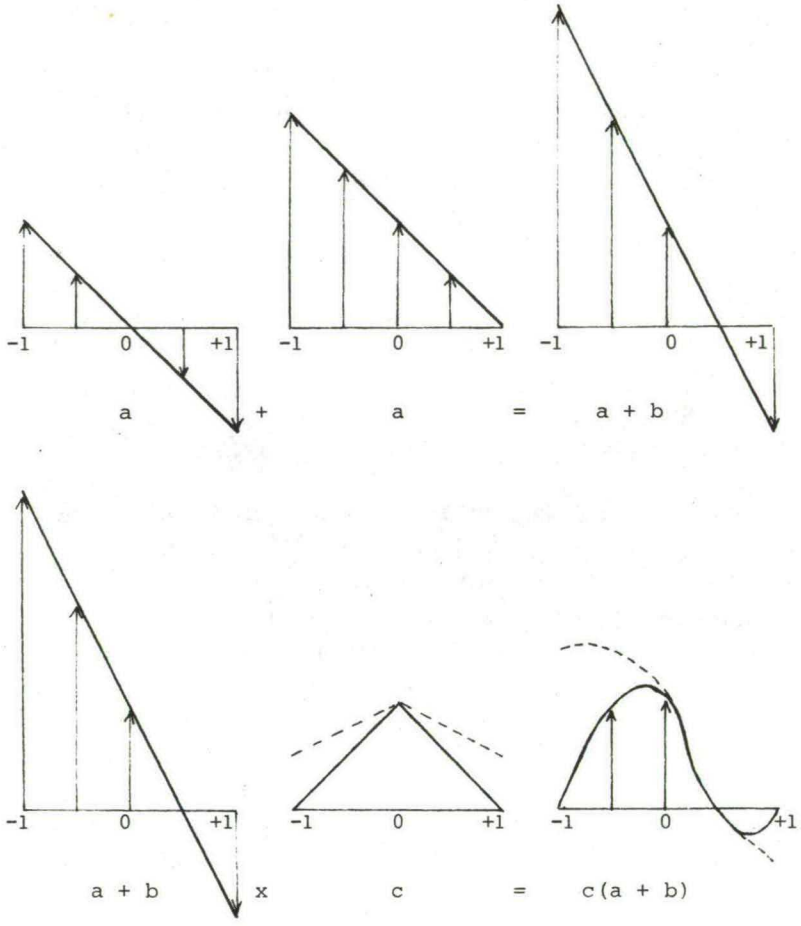

Figure 2-2. Social comparison model.

must be considered in the light of the tendency to compare oneself with Other (c). The result c(a + b) indicates I's eventual attempt to alter his position on dimension dx (see drawn line)[1].

The figure shows that I will not change his position in relation to Other when P_I is maximally superior or inferior in the comparison with P_O. (I does not compare himself with Other in such cases). If P_I is equal to P_O then I experiences a strong inclination to improve his position in relation to that of Other. This inclination is strongest when P_I is only just inferior to P_O. This inclination disappears when P_I is rather superior to P_O and changes to a slight tendency for I to weaken his position as P_I increases in superiority, in comparison with P_O. (This applies up to maximal superiority for P_I at which point no further comparison is made).

The above is only applicable to situations in which I's tendency to compare himself with Other is determined by internal factors (i.e. how big the difference is between P_I and P_O). However, if external factors are involved, for instance, if an observer is comparing P_I with P_O, I can hardly reduce the intensity of the comparison or put an end to it (in cases of maximum difference). This is expressed by the dotted line (c) in Figure 2-2. If the vectors (a + b) are considered in conjunction with the intensity, as indicated by the dotted line (c), I's tendency to alter his position on dimension dx is as indicated by the dotted line c(a + b) in Figure 2-2

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1) Footnote: Rijsman (1979b) derived a mathematical function to express this result. If "y" is the force needed for P_I to shift from a certain point of comparison (in relation to P_O) to 0, the integrative tendency can be expressed as $y = -x$ and the discriminative tendency as $y = -x + 1$. The sum of the two tendencies is thus $y = -2x + 1$. The inclination to compare oneself (c) can be expressed by the function $y = 1 - |x|$. For $-1 \leqslant x < 0$, c(a + b) will be $y = -2x^2 - x + 1$ and for $0 < x \leqslant +1$, it will be $y = 2x^2 - 3x + 1$. y intercepts the x-axis when $x = -1$, $+\frac{1}{2}$ and $+1$. y reaches a maximum at $-\frac{1}{4}x$ and a minimum at $+\frac{3}{4}x$.

(see, also, Poppe and Rijsman, in press). This shows that I, in such a situation, continues to alter his position in relation to Other, even in cases of maximum difference.

The model has been described for the situation in which the Individual compares himself, in each example, with one and the same Other. As reported in 2.2. it is possible for I to change his comparison-Other. If he does so he will then change the position of P_I according to the outcome of the comparison with the new comparison-Other. In this way it will be seen, for example, that an Individual whose P_I is clearly superior to P_O will try to improve the position of P_I relative to P_O. The reason for this is that I has meanwhile embarked on a comparison of P_I with a new P_O, to whom P_I is either inferior or equal.

The social comparison model, as above, has been described as part of Rijsman's recently formulated social motivation theory. This theory provides a more extensive basis and framework for the comparison model previously (Rijsman, 1974; Rijsman and Poppe, 1977) derived from Festinger's (1954) theory of social comparison. The vectors (a) in Figure 2-2 indicate the "pressure toward uniformity" (Festinger's derivation D) and the vectors (b) a "pressure upward" (Festinger's Hypothesis IV). Festinger's Hypothesis III ('The tendency to compare oneself with some other specific person decreases as the difference between his opinion or ability and one's own increases') is reproduced in line (c) in the model.

In order to test predictions from this social comparison model, a series of experiments was performed. These consisted of giving subjects (students, in most of the experiments), whose performance (a series of reaction times) had been measured, bogus feedback about their performances. According to this feedback some were slower and others faster than other subjects whose reaction times had been measured simultaneously.

In a third condition subjects were told that they were just as fast as the other. The experiments were performed in two settings. In some experiments (or parts of them) subjects were put under relatively heavy pressure to compare themselves with the other (an observer-experimenter was present), in others there was relatively little pressure (subjects were, as far as possible, anonymous and in separate rooms). It was predicted that, in both settings, the subjects who had been informed that their performance was superior to Other's would not speed up their reaction to the same extent as those who had heard that their performance was the same as Other's or, (for the 'heavy pressure' condition, only), inferior to Other's. These predictions were confirmed in the majority of experiments (see Rijsman, 1974; and Poppe and Rijsman, in press, for a more detailed overview).

2.4. Elaboration of Rijsman's theory in the field of equity and role distribution.

Rijsman (in press, a, b) has described a number of applications and implications of the attribution-, comparison- and validation principles described. We shall now describe two of these, namely, equity and role distribution.

According to the equity norm, as formulated by Adams (1965) an individual will experience the outcomes he obtains for his inputs as equitable when the ratio of his inputs and outcomes corresponds to the inputs/outcomes ratio of an Other with whose inputs and outcomes I can compare his own. Adams expressed this in the formula:

$$\frac{\text{Inputs}_I}{\text{Outcomes}_I} = \frac{\text{Inputs}_O}{\text{Outcomes}_O}$$

This formula can be rewritten as:

$$\frac{\text{Inputs}_I}{\text{Inputs}_O} = \frac{\text{Outcomes}_I}{\text{Outcomes}_O}$$

The left-hand side of the formula now consists of the inputs.

In fact, this side of the formula involves a comparison of P_I with P_O. Individual (I) will want to have his subjective opinion about the outcome of this equation validated. This validation takes place by means of the outcomes which I can interpret as an evaluation of the cues for P_I and P_O. I sees as a correct validation an outcome ratio that exactly reflects the input ratio. Furthermore, this interpretation of Adams' views on equity reveals an aspect that was not mentioned by Adams himself. In the course of comparing P_I and P_O, I will strive to attain a certain superiority of P_I, in relation to P_O. This means that he will attach a higher value to his own inputs than to that of Other. Naturally, he will want to find the input ratio reflected in the ratio of the outcomes.

In a further example of social comparison and validation in operation, Rijsman (in press, a, b) demonstrates the need for role distribution in social interaction. If two interacting individuals make mutual comparisons with one another on one and the same dimension, this gives rise to the problem that both wish to be superior to the Other, and to make it clear to Other that he occupies an inferior position on the dimension. This will lead to a negative reaction of the persons to one another.

This problem does not arise when this one dimension is split into two value dimensions and when the one is considered important for the one individual and the second important for the Other. If each of the two excels on his "own" dimension then validation of Other's position on the other dimension needs not present problems. Rijsman believes that this can only happen when the two dimensions are complementary to one another and are united in an objective shared by the two, interacting persons.

CHAPTER 3

A COGNITIVE STRUCTURE OF SOCIAL MOTIVES

3.1. Introduction

In chapter 1 we remarked, among other things, that there are many motives that can be used to describe the behavior of subjects in mixed-motive games. Chapter 2 expounded the motive of social comparison as a means of explaining interpersonal behavior. In this third chapter we shall relate the social comparison motive, using empirical methods, to the set of motives mentioned in chapter 1. In this chapter we shall be employing methods taken from cognitive psychology. These methods offer the best way of studying the importance of the various motives because adopting the single individual-intra-personal approach makes it possible to minimize undesirable influences such as strategic behavior and social approval. In the following chapters we shall be examining the significance of the various motives in situations involving interaction between two individuals.

The influence of the social comparison motive is felt on the competition-martyrdom axis of Figure 1-7, as on this axis the issue is one of relatively higher or lower outcomes for a person, in comparison with outcomes of an Other.
Evidence for the relative importance of the competition axis in research at the cognitive level can be found in an article by Maki, Thorngate and McClintock (1979).
In the second of the experiments they describe each subject is presented with five series, each of 20 four-choice decomposed games. The subject is told that a Chooser has consistently made the same choice. He is shown this choice in 8 of the 20 games. In the remaining 12 games the subject is asked to predict what choice the Chooser will make. The subjects were distributed over eight conditions. In each condition the Chooser, whose choice the subjects must predict, consistently

chooses according to a different motive (individualism, cooperation, altruism, martyrdom, masochism, sadomasochism, aggression or competition). In this connection we were not, in the first place, interested in the main conclusion that some motives are easier to predict and to learn than others. Of greater significance, here, is the information obtained from two additional questions posed after 100 games had been completed. In one of these the subject was asked to indicate what weight the Chooser attached to his own outcomes and to those of Other. These weights ranged (after linear transformation) from -4 (Chooser wanted to avoid giving cents to Self (Other)) to +4 (Chooser wanted to give as many cents as possible to Self (Other)). One would expect the weights given by subjects who had to predict that the motive was "competition" to fall in the quadrant of positive weights for Chooser and negative weights for Other. This was, indeed, the case. But this same quadrant also contained the weights allocated by the subjects asked to predict "individualism" and "aggression". On the other hand, not only the weights allocated by the subjects who had to predict "martyrdom" but also those weights pertaining to "altruism" and "masochism" fall in the quadrant of negative weights for Chooser and positive weights for Other. Those subjects who had succeeded in predicting that the motive was "cooperation" or "sadomasochism" also allocated the correct weights to the outcomes for Self and Other. However, those who did not succeed in learning that the motive to be predicted was "cooperation" or "sadomasochism" allocated weights in the same quadrant as the weights given by subjects who had had to predict "competition", "individualism" or "aggression". In general terms this means that the subjects who were unable to figure out which motive had to be predicted allocated weights which were positive for one of the two persons (Self or Other) and negative for the other person. This bias is even evident in several subjects who <u>did</u> succeed in predicting what the motive was. (An exception to this tendency are subjects who had to

predict "competition" or "martyrdom". In their case it would not be right to speak of a bias since the correct weights for them actually fall in the positive/negative and negative/positive quadrants, respectively). This indicates that there must be rather a strong tendency to see the outcomes of Chooser and Other as being negatively correlated, and points to the significance of the competition dimension, or, in other words, the social comparison motive.
The subjects were also asked to rate the Chooser on 22 9-point bipolar adjective scales, such as impolite-polite, active-passive, ungenerous-generous, kind-unkind, calm-agitated, punishes self-punishes other, stable-unstable, selfish-unselfish, just-unjust. A discriminant function analysis performed on the ratings resulted in only one significant discriminant function, which accounted for 48.3% of the discriminatory power of the battery of derived functions. According to this function, Choosers are ordered along the dimension in three groups: a) competition, aggression and individualism; b) sadomasochism and cooperation and c) martyrdom, masochism and altruism. The exact location of group centroids is reproduced in Figure 3-4. The overall tendency is for the sequence to coincide with the projection of the motives on the competition dimension.

Despite the fact that the study by Maki c.s. provides some clear indications of the relative importance of the competition-axis, it has not yet been conclusively demonstrated that the competition-axis is, even in general terms, of relatively greater significance than the cooperation-, individualism- and altruism-axes. A possible explanation of the findings of Maki c.s. is that they may have carried out their research with subjects who were predominantly motivated by competition. If, however, they had carried out the same study with subjects who were motivated by, for instance, cooperation, they would perhaps have found bias in the direction of the axis which is perpendicular to the compe-

tition-axis.

In the study to be reported here we shall examine whether this last supposition, namely, that when evaluating the choices made by others, people display a bias in the direction of their own dominant motivation, is correct. Or whether the competition-axis is, in fact, the most important one, regardless of the evaluators' dominant motivation.

For the purposes of this study it is not necessary to have the subjects learn the choices of one or more Choosers prior to the experiment. We can inform them directly what the choice of a certain Chooser was. We can situate these choices in a circle around the midpoint or some other point in a set of coordinates, as shown in Figure 1-7. There is, however, a good reason for not taking the midpoint of the set of coordinates as the center of the circle. This is because if the two main axes have identically graduated scales (as is the case in Figure 1-7) the cooperation-masochism axis will then automatically indicate the alternatives that would yield equal outcomes for Chooser and Other. This would mean that the goals ascribed to alternatives along the cooperation-sadomasochism axis would coincide with the equality motive. For this reason the midpoint of the set of coordinates will not be taken as the center of the circle.
Apart from the influence of the equality motive, we shall also attempt to minimize the effect of the equity motive. According to the latter motive, the outcomes for two people would have to be in proportion to their respective inputs. The influence of the equity motive can be minimized by constructing the situation in such a way that there are no inputs, or by introducing an element of chance.

After due consideration of these last points we opted for a study in which subjects were confronted with a hypothetical situation, namely, a lottery being held in 9 different states (of the U.S.A.). In each state there are two winners and a

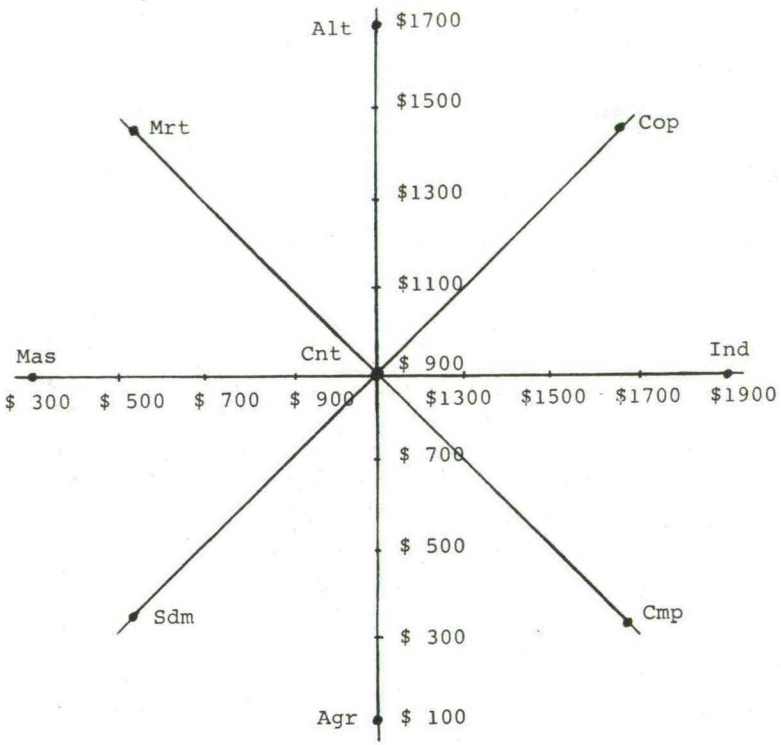


Figure 3-1. Structure of motivation axes and choice alternatives.

coin is tossed to decide which of the two can choose one of the nine alternatives, each of which will yield a certain sum of money to the Chooser and the other prizewinner. The nine choices can be seen in Figure 3-1, filled in on a set of coordinates similar to that in Figure 1-7. As can be seen, the alternative of $1100 for the Chooser and $ 900 for the Other has been taken as center of the eight remaining points, which

all lie approximately in a circle around this center. It so happens that, in every state, the person who is allowed to choose selects a different alternative. The subject is asked to indicate, on a 9- point scale, how (dis)similar he considers the goals of two Choosers, taking a different pair of Choosers per evaluation.

If it is social comparison that is the subjects' main motive then one will expect the goals associated with the alternatives on the competition-axis to be seen as relatively less similar and those associated with alternatives on the cooperation-axis as relatively more similar. The result will be that the circular structure in Figure 3-1 will be altered on the basis of the evaluations of similarity as regards the respective goals, and will be elongated to an ellipse with its longest axis following the competition-axis. This must hold true, irrespective of the subject's own dominant motivation. If the subject's dominant motivation is significant, here, one will still see an elliptical figure but this time the longest axis will follow the axis indicating the subject's dominant motivation.

An essential part of this study is the determination of the dominant motivation of the subjects. The current way of doing this, since 1975, has been a classification method, as described by Kuhlman & Marshello (1975a). According to this method the subjects are presented with a series of 3-choice decomposed games. These games are of 4 different types. In one type, for instance, the individualism, competition and cooperation motives each lead to the choice of a different alternative (triple dominance type). In another, the individualism and competition motive prompts the choice of a certain alternative, cooperation leads to the choice of a second alternative and the third alternative is undetermined (PDG type). If the subject demonstrates a certain degree of consistency in his choices in all four types of game, for example, consistent choice of the individualistic alternative,

it is assumed that this subject's dominant motivation is individualism.
The following comments relate to the reliability and validity of the classification procedure: Kuhlman and Marshello (1975a) showed that the chance of ascribing a certain dominant motivation to someone who chooses in a random fashion is relatively small. Using criteria that were not too stringent, they found that less than 5% of the subjects could be expected, on the basis of chance alone, to be classified in one of the three categories, "individualistic", "competitive" or "cooperative". Kuhlman and Wimberley (1976) demonstrated that there is a high degree of consistency in the choices of experimental subjects. Kuhlman and Marshello (1975a) and Bennett and Carbonari (1976) found that there is a difference in personality characteristics between groups of subjects with different dominant motivations as determined by the classification procedure. Furthermore, it seems that categories of subjects differentiated by the classification procedure have different expectations about the behavior of others in experimental games (Kuhlman & Wimberley, 1976) and even differ in their behavior in response to a certain strategy of the Other in a Prisoner's Dilemma Game (Kuhlman & Marshello, 1975b).

As a second criterion to classify the dominant motives of the subjects in this study, we shall make use of the choices in five Commons Dilemmas. A Commons Dilemma (see also Dawes, McTavish and Shaklee, 1977) can be considered as equivalent to a decomposed Prisoner's Dilemma for 2 or more persons. Each of the members of a group makes, independently of the others, a choice between two alternatives, both of which have consequences for the outcomes of the person himself and for each of the other members of the group. The one alternative (Cooperation) yields a small reward for the person who chooses it and a small fine for the others. The other alternative (Defection) yields a large reward for the Chooser

and a large fine for the others. Each of the members obtains the highest outcomes if all of them make the C-choice. If one person chooses D while the others choose C, the chooser of D will increase his own outcomes at the expense of the others' outcomes. However this relative advantage for the D-chooser diminishes when more members of the group make a D-choice. If everybody chooses D, this means the lowest possible outcomes for each person.

3.2. Method

3.2.1. Subjects

Participants in the study were 69 female and 29 male undergraduates at the University of California, in Santa Barbara (ages approximately 18 to 22). Participation in the study earned credits for the subjects, as part of a requirement for their introductory course in psychology.

3.2.2. Procedure[1)]

The study consisted of four parts, namely, a) a study of the Commons Dilemma, b) a classification of the subjects according to the Kuhlman and Marshello (1975b) method, c) a series of evaluations in which subjects indicated the degree of (dis)similarity between the motives prompting the choices of two hypothetical Choosers (per evaluation) and d) rating some of these choices on a number of scales. The four parts were carried out in this order and in direct succession. For the first part, random groups of 5 subjects were composed[2)]. Although this was not necessary, these groups were left intact, for practical reasons, during the remaining three parts of the study.

Footnote 1): The study reported here has been carried out in combination with a study by Fran Talarowski on the Commons Dilemma. This latter study related to parts a) and b).
Footnote 2): If a subject in a group failed to show up his place was taken by a stooge so that the total of 5 per group was assured.

Ad a) Commons Dilemmas

A video monitor was used to instruct the subjects that they were to make a number of choices, each of which would yield outcomes for themselves and for the other members of the group. An example of a Commons Dilemma was shown on the monitor and the consequences of the possible choices were explained. Further, subjects were told that one of the Dilemmas would be selected at random and that the members of the group would be paid according to their choices in that Dilemma. Subjects then proceeded to make a choice in each of five Dilemmas. The 5 Commons Dilemmas that were used have been included as Appendix 1. This appendix contains an example of a pay off-structure of one of the Dilemmas, too.

Ad b) Classification

In this part of the study the instructions were again presented by video monitor. Subjects were told that for this part of the study each participant would be randomly paired with another participant. The other participant might be a member of his own group or one of the other groups that had participated or were going to participate in the study. A 3-choice decomposed game was shown on the video monitor and an explanation was given about the outcomes that a certain choice by the person himself plus a choice by the other of the pair would yield. The subject was asked to write down his first choice for each of the 24 situations. These 24 games are 12 games taken from Kuhlman and Marshello (1975b). Each of the games was repeated once. The 12 decomposed games that were used can be seen in Appendix 2.

Ad c) Comparisons

Each person was given a form with the following instructions:

> For this task you will be provided information concerning the behavior of lottery winners in nine states. In each state there were actually two winners, and by a flip of a coin one of the winners in each state was permitted to choose one of nine different ways to reward himself and the other winner in his state. The nine alternative ways to reward self and others were the same in each state,

and are listed below:

	ALTERNATIVES INITIALLY AVAILABLE								
Giving Himself	$1100	$1700	$300	$1700	$1100	$1100	$500	$1900	$ 500
Giving other person	$ 100	$1500	$900	$ 300	$ 900	$1700	$300	$ 900	$1500

After careful deliberation, each decision maker in each state chose a different one of the nine alternative ways to award sums of money to himself and the other winner in his state.

The actual choices are given below:

	Allocation chosen	
	self	other
State A	$1100	$ 900
State B	$ 500	$1500
State C	$1100	$ 100
State D	$1700	$ 300
State E	$1900	$ 900
State F	$1700	$1500
State G	$1100	$1700
State H	$ 500	$ 300
State I	$ 300	$ 900

We know that the chooser in each state had some goals in mind when he chose one of the nine ways to allocate the rewards to self and other winner in his state. Your task is to indicate how similar or different you believe the nine choosers' goals were to one another. To help you make these judgments of similarity, we will ask you to rate how similar or dissimilar you believe each chooser's goals were to each of the other choosers' goals, based upon their choices. It is important to remember that the chooser in each state could select any one of the nine different combinations of rewards for self and for other. In evaluating the similarity of the goals of two choosers in two states, it is important to consider both the rewards the choosers selected for themselves and others, and the rewards they could have chosen but did not. In each of the following tables you will notice that the preferred choices by the decision makers in two states are circled. Your job is to judge how similar you believe the goals of these two decision makers were. Below each table there is a 9-point scale ranging from very dissimilar to very similar. Mark an X to indicate where your judgment concerning the similarity of the decision makers' goals falls on this scale. Remember, always make your evaluation in terms of what choices the decision makers made and did not make.

After this the nine stimuli were presented randomly, in pairs:

The two alternatives circled below represent the choices of two of the nine state winners. Rate the degree of

similarity between the goals of these two choosers based upon the alternative they selected from the nine which were initially available to all of the state winners.

	ALTERNATIVES INITIALLY AVAILABLE								
Giving Himself	$1100	$1700	$300	$1700	$1100	$1100	$500	$1900	$ 500
Giving other person	$ 100	$1500	$900	$ 300	$ 900	$1700	$300	$ 900	$1500

The goals of these choosers were:
very dissimilar __ __ __ __ __ __ __ __ __ very similar.

And thus all 36 pairs of choices. Half of the subjects were shown the pairs in reverse order.

Ad d) Ratings

Finally, the subjects were given three of the 9 alternatives and asked to indicate the relevance of a number of descriptions of the Chooser's motives. Each subject received the $1100/$900 alternative plus two choices relating to one of the axes in Figure 3-1. This axis was determined at random. The form appeared as follows:

> The choices of three of the state winners are circled below. As described previously, each of these choices affords rewards to self and to other state winner. Please review carefully the reward Chooser 1 afforded himself and the other winner in this state (other person), as well as the rewards the chooser could have but did not afford self and other. After this review, please fill out the scales listed underneath Chooser 1, and then do the same for Chooser 2 and Chooser 3. Use an X for each scale to indicate how the chooser's goals can be described on that scale. Please make a rating on every scale.

1. Chooser 1:	ALTERNATIVES INITIALLY AVAILABLE								
Giving Himself	$1100	$1700	$300	$1700	$1100	$1100	$500	$1900	$ 500
Giving other person	$ 100	$1500	$900	$ 300	$ 900	$1700	$300	$ 900	$1500

Aggressive ..... not at all _ _ _ _ _ _ _ _ _ very much
Martyr-like ..... not at all _ _ _ _ _ _ _ _ _ very much
Individualistic ... not at all _ _ _ _ _ _ _ _ _ very much
Sadomasochistic ... not at all _ _ _ _ _ _ _ _ _ very much
Altruistic ..... not at all _ _ _ _ _ _ _ _ _ very much
Competitive ..... not at all _ _ _ _ _ _ _ _ _ very much
Masochistic ..... not at all _ _ _ _ _ _ _ _ _ very much
Cooperative ..... not at all _ _ _ _ _ _ _ _ _ very much
Self-sacrifying ... not at all _ _ _ _ _ _ _ _ _ very much
Sadistic ..... not at all _ _ _ _ _ _ _ _ _ very much
Selfish ..... not at all _ _ _ _ _ _ _ _ _ very much
Equalitarian ..... not at all _ _ _ _ _ _ _ _ _ very much

The same for Chooser 2 and Chooser 3.

3.3. Results

3.3.1. Classification of subjects

The 24 games are made up of 4 types, each type consisting of 3 games each of which is presented twice. A subject was allocated to a particular category if he made the choice appropriate to that category in at least four of the 6 games in each type. According to this criterion 55 of the 98 subjects could be classified as being predominantly motivated by altruism, cooperation, individualism or competition.

Table 3-1 shows the distribution, per sex, of these motivational attitudes.

In order to obtain the best possible guarantee that the subjects to be included in the analysis did, indeed, have the motivational attitudes ascribed to them, a second selection criterion was applied, namely, the number of

cooperative choices made in the 5 Commons Dilemmas. The figures in brackets in Table 3-1 show the numbers of subjects who also met this second criterion. The two criteria overlap to a certain extent ($\chi^2 = 3.54$, $p = 0.07$). As can be seen from Table 3-1, 33 subjects apparently met both criteria, these subjects representing eight from each sub-group, with the exception of the altruists, nine of whom met both criteria.

In order to keep the four sub-groups equal in size one subject, chosen at random, was dropped from the latter group.

	Men	Women	Total
Altruistic	1 (0)	17 (9)	18 (9)
Cooperative	7 (4)	7 (4)	14 (8)
Individualistic	6* (4)	5 (4)	11 (8)
Competitive	5 (4)	7 (4)	12 (8)
	19 (12)	36 (21)	55 (33)
Not classifiable	10	33	43
Total	29	69	98

Table 3-1. Distribution, per sex, of subjects according to motivational orientation. (Figures in brackets refer to the number of subjects with 3 or more cooperative choices (for Altruistic and Cooperative) or 2 or less cooperative choices (for Individualistic and Competitive) in the 5 Commons Dilemma games).

* There were no data available on the Commons Dilemma for one male subject.

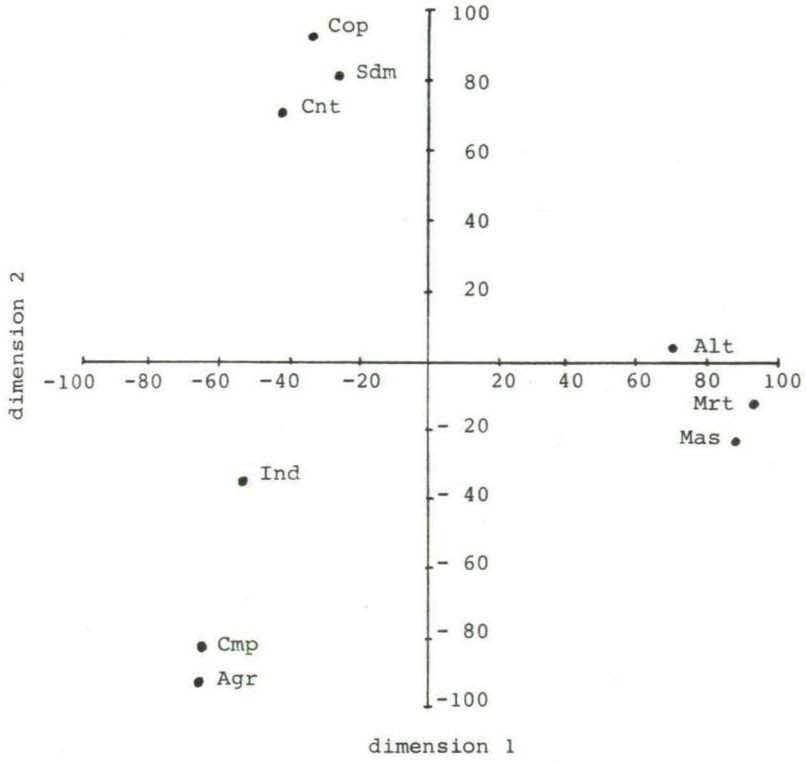


Figure 3-2. INDSCAL structure.

3.3.2. Comparisons of the goals

The (dis)similarity evaluations by the subjects were subjected to an INDSCAL analysis (Carroll & Chang, 1970), for which a computer program of the MDS(X) series was used. This makes it possible to calculate, per subject, the mean correlation between the subject's original data and the scaling results. Even if only one dimension is singled out in the analysis, the mean correlation for all subjects is still 0.70. This correlation rises to 0.86 when a two-dimensional solution is decided upon. The relative importance of the two dimensions

can be seen from the ratio of the values $\sqrt{\text{eigenvalue}/N}$ for each of the two dimensions. These values are 0.724 and 0.358, respectively, which means that dimension 1 can be considered approximately twice as important as dimension 2. This two-dimensional solution is shown in Figure 3-2.
It appears that the alternatives in Figure 3-2 scattered into 3 sub-groups: group A, made up of the points Cmp, Ind and Agr, group B, made up of the points Mrt, Alt and Mas, and group C, made up of the points Cop, Sdm and Cnt. The first and most important dimension in the structure is determined by group B's differentiation from group A, leaving group C in an intermediate position. The second dimension emerges through group C's differentiation from group A, with group B occupying the intermediate position.

The structure reproduced in Figure 3-2 is a mean structure for all subjects. The structure actually differs, slightly, from one subject to another, since each of the two dimensions has different weights for each subject. These weights are reported in Figure 3-3. It is also clear, from this figure, that dimension 1 is more important than dimension 2.
This is because the majority of points tie on the right hand side below the bisector dividing the quadrant into two equal parts.
We examined whether the altruistically, cooperatively, individualistically and competitively oriented subjects differed from one another with respect to their positions in Figure 3-3. To this end we calculated, per subject, among other things, the ratio between the weight on dimension 1 and on dimension 2. A non-parametric analysis of variance (Kruskal - Wallis) was carried out on these ratios. No differences were found between the groups ($\chi^2 = 4.05$, n.s.). Partly because of the large variances within the groups, other approaches also failed to reveal any differences between the groups.

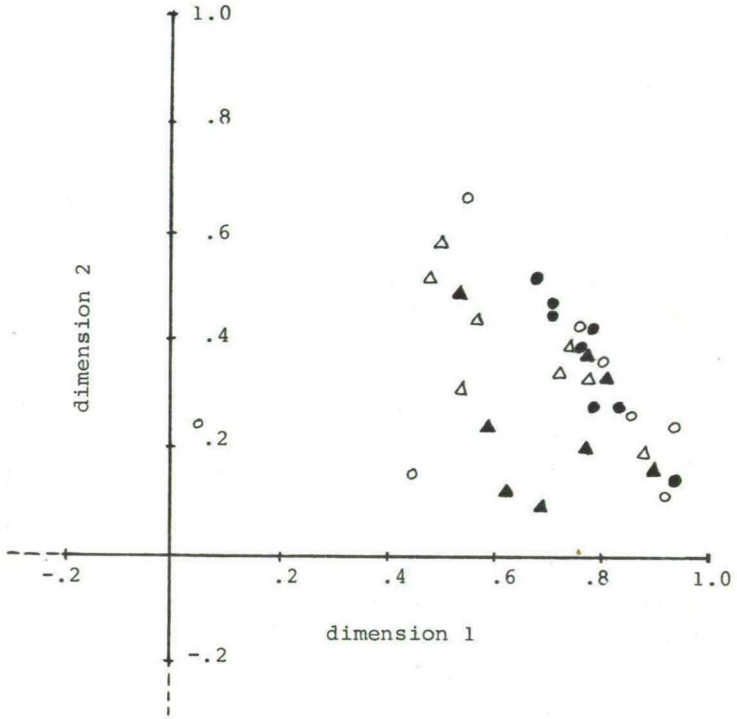


Figure 3-3. Weights of subjects on INDSCAL dimensions.
(● = Competitor; ▲ = Individualist
O = Cooperator; Δ = Altruist)

3.3.3. The ratings of the choices

As reported, each of the 98 participants in the study was confronted with 3 of the 9 choices and asked to indicate how relevant each of 12 labels was to the goals associated with the choices. In this way four groups were formed. One group evaluated the goals associated with the choices Ind, Cnt and Mas, a second group the goals belonging to the choices

Cop, Cnt and Sdm, a third group the goals belonging to the choices Alt, Cnt and Agr and a fourth group the goals belonging to the choices Cmp, Cnt and Mrt. The evaluations of the goals belonging to the choice Cnt were not taken into consideration for the purpose of the analysis. Each of the four groups was randomly divided into two equal sub-groups. The data for one of the two remaining choices was taken from one sub-group and the data for the other choice from the second sub-group. This procedure yielded 8 randomly selected sub-groups, each of which evaluated the goals of one of the eight choices, according to the relevance of twelve different labels. The numbers per sub-group are given in Table 3-2. The numbers in the sub-groups in Table 3-2 are not all identical because of the random allocation of the subjects to the groups and because, in cases of missing data, the subject concerned is dropped from the analysis. The latter reason explains why the total number of subjects in Table 3-2 is 91 instead of 98. The classification of the subjects according to their dominant motivation was left out of consideration in this section of the results, in view of the low numbers per sub-group that this would otherwise have entailed.

	Self	Other	n discriminant analysis I	n discriminant analysis II
Individualism	($1900;	$ 900)	7	10
Cooperation	($1700;	$1500)	12	11
Altruism	($1100;	$1700)	14	14
Martyrdom	($ 500;	$1500)	10	14
Masochism	($ 300;	$ 900)	9	8
Sadomasochism	($ 500;	$ 300)	12	12
Aggression	($1100;	$ 100)	14	13
Competition	($1700;	$ 300)	13	9
Total			91	91

Table 3-2. Numbers of subjects per choice to evaluate.

A discriminant function analysis was performed on the scores of these eight groups, each of which evaluated a different choice. This analysis revealed a single discriminative function which accounted for 79.8% of the discriminative power of all the derived functions (Wilks' Lambda (66) = 0.2249, $p < 0.001$).
In order to obtain some idea of the internal consistency of the data, a second discriminant function analysis was carried out. This was performed on the evaluations of the points which had been omitted from the first analysis. Besides yielding a primary significant function, accounting for 69.6% of the discriminative power (Wilks' Lambda (66) = 0.I716, $p < 0.001$) this second analysis also revealed a second significant function which accounted for 16.0% of the discriminative power (Wilks' Lambda (50) = 0.3870, $p < 0.01$). This second function, a difficult one to interpret, was not found, however, in the first analysis, and therefore, will not be given further consideration in this study. Figure 3-4 shows the group centroids on the first dimensions. The rank correlations between the positions on the two dimensions is 0.83 ($p = 0.01$).

For the points with positive discriminant function scores, labels "martyrlike", "equalitarian", "self-sacrifying" (in the second analysis), "cooperative" (in the first analysis) and "masochistic" (in the second analysis) were considered appropriate. The labels considered relevant to the points with negative discriminant function scores were "competitive" (in the first analysis), "selfish" and especially, "aggressive". (See Appendix 3 for standardised discriminant function coefficients).

3.4. Discussion

What strikes one, first and foremost, in the analysis of the (dis)similarity scores and the analysis of the labeling scores in the high degree of conformity between the results of the analyses. Obviously, a high degree of similarity can be

expected between the two discriminant function analyses of the labeling scores, as the data in these two analyses are not independent of one another. While the results of the INDSCAL analysis came from the same subjects, they were obtained by a very different method. In order to make a true comparison with the results of the discriminant function analysis, an INDSCAL analysis was made of the (dis)similarity scores ascribed to the goals belonging to the eight choices lying off-center in the structure shown in Figure 3-1. The INDSCAL structure yielded by these 8 choices is virtually identical to that of the 9 choices. The first dimension of the analysis of the structures of the 8 choices is presented together with the results of the discriminant function analysis in Figure 3-4, for the purpose of comparison. Figure 3-4 also shows the results of the discriminant function analysis of the second experiment by Maki, McClintock and Thorngate (1979). On each of the four dimensions, the points scatter, forming three groups. These three groups are: a) Cmp, Agr, Ind; b) Cop and Sdm; and c) Alt, Mrt and Mas. The three groups lie, each time, in the same sequence. A comparison of the points within the groups reveals many transpositions. However, in a comparison between groups there is only one instance of a point from the one group being exchanged for a point from the other group. (This exception is the transposition of Alt and Sdm in discriminant function analysis I).

The rank correlations of the positions on the four dimensions range from 0.76 to 0.95. With the exception of the lowest correlation, which is significant at 5%, all the rest are significant at the 1% level. The dimension can be interpreted as follows. The points Cmp, Agr and Ind indicate the alternatives in which Chooser's outcomes are higher than Other's. The opposite is true at points Alt, Mrt and Mas: Other receives more than the Chooser himself. The points Cop and Sdm are the alternatives in which the outcomes of Chooser and Other are most similar to one another. This was reported

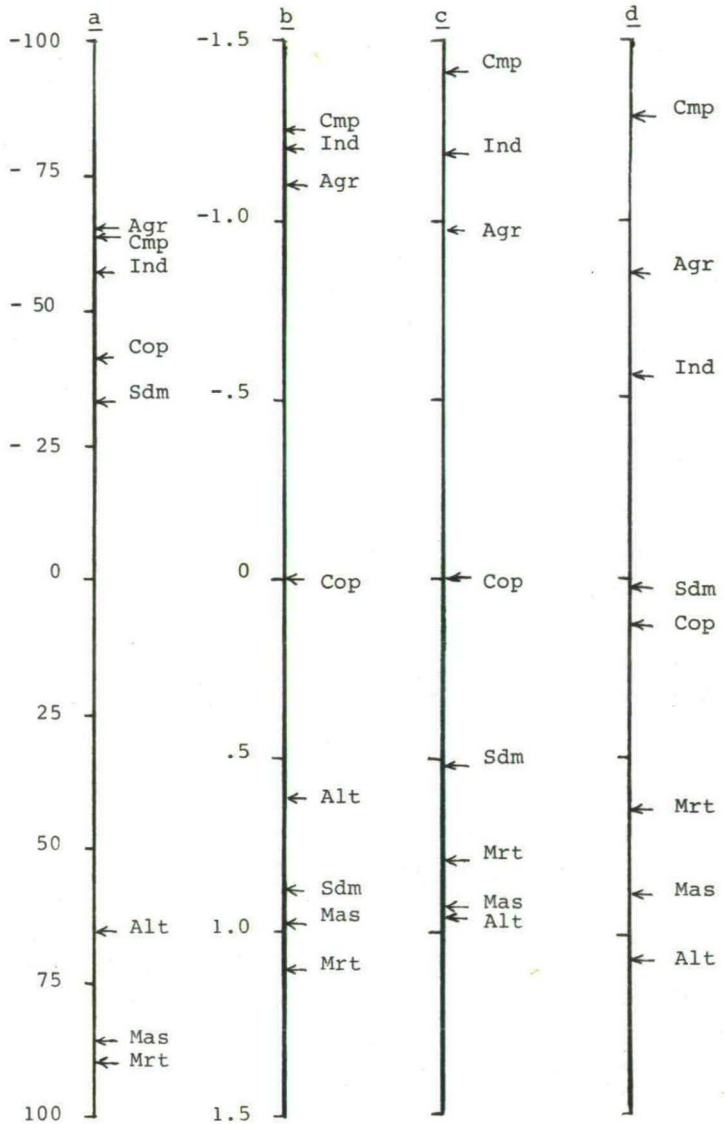


Figure 3-4. Overview of results of the INDSCAL (a) and discriminant function analysis (b and c) from the present study and from the study by Maki c.s. (1979) (d).

by Maki c.s. (1979, pp. 214-215) and is, likewise, clearly applicable to our own study. In its totality the dimension can be interpreted according the line: me more than Other, both the same, Other more than me. One can justifiable speak of a social comparison dimension, here. In this connection it seems worthwhile taking a look at the second dimension of the INDSCAL analysis, which can be interpreted as a dimension of equality versus inequality. The question arises as to whether or not the first dimension (more for me versus more for Other) might partially be determined by the presence of alternatives which contain a degree of equality in outcomes. To examine this at greater depth, an INDSCAL analysis was made of only those choices situated on the axes of the Griesinger and Livingston (1973) model (the points Ind, Alt, Mas and Agr). Here, again, the dimension of the points Ind and Agr versus Alt and Mas emerges as the first dimension (which is at least twice as important as the second dimension) and, as second dimension, the one formed by the points Ind and Alt versus Mas and Agr. Once again the first dimension underlines the social comparison dimension. It justifies the proposition that, in psychology, it is more appropriate to consider the diagonals in the model as the primary structure. In general, it is difficult to exclude from consideration an equality dimension, which always runs parallel to the Sdm-Cop diagonal. This is not only true in the empirical sense but also from the theoretical point of view. In chapter 2 we have already explained that social comparison is determined by tendencies towards equality and towards inequality.

The results of the INDSCAL analysis of the choices Ind, Alt, Mas and Agr also provide part of the solution to another noticeable problem. In the structure of Figure 3-1 the alternatives have been selected in such a way that they lie in a circle with the $1100/$900 alternative as its midpoint. If, however, the distances between alternatives on the same axis are compared, it appears that between the alternatives

Ind and Mas there is a difference of $1900 - $300 = $1600 in Chooser's own profit. The difference between the alternatives on the altruism axis is $1700 - $100 = $1600 in profit for Other. On the competition axis the difference is ($1700-$300) - ($500-$1500) = $2400 difference in relative profit and on the cooperation axis the difference is ($1700+$1500) - ($500+$300) = $2400 difference in joint profit. This means that the differences along the competition and cooperation axes are greater than those along the individualism and altruism axes. This could be an explanation of the finding that the competition axis and the cooperation axis are the two most important dimensions encountered in the INDSCAL analysis. However, it fails to explain why these two axes are also the major dimensions in the INDSCAL analysis of the four choices Ind, Alt, Mas and Agr.

A remarkable point in the INDSCAL results for the similarity data on the comparison of the motives associated with the various choices, is the lack of any difference between the altruistically, cooperatively, individualistically and competitively oriented sub-groups which were included in the study. In this connection it may be of interest to report one of the author's own experiences. It happened on two occasions that a subject was missing from a group of five and that the author himself acted as fifth man. In this situation he, too, was given the task of scoring the nine goals on the basis of (dis)similarity. Naturally, he was very familiar with the objective structure shown in figure 3-1 and attempted to determine the 36 evaluations of (dis)similarity in such a way that they would coincide with this objective structure. This appeared to be a virtually impossible task. Long after the subjects had departed he was still racking his brains over this problem, whereas the subjects had completed their scoring in a relatively short period of time. This means that they must have worked with a certain bias, a certain criterion that was used when allocating scores. The obvious assumption

is that this criterion must have been their own dominant motivation. In fact, the salience of this motivation was reinforced by the fact that directly before the comparison of the motives, the 32 selected subjects had actually made highly consistent choices for a particular motive, in the two classification tasks. This might have created a set for this motive. In the implicit structure of motives, as reflected in the results of the INDSCAL analysis, this motivational set does not appear to be involved. This amounts, in fact, to a further underlining of the salience of the social comparison dimension, which emerges as the major dimension in each of the four sub-groups.

This chapter has demonstrated how important the social comparison dimension is in the cognition of experimental subjects. In the following chapter we shall see whether the social comparison dimension also plays a role in concrete, interpersonal behavior.

CHAPTER 4

ASYMMETRY IN OUTCOME STRUCTURE AND POSSIBILITIES OF CHANGING THE STRUCTURE AS DETERMINANTS OF ACTUAL CHANGES IN THE OUTCOME STRUCTURE.

4.1. Introduction

In the previous chapter it was demonstrated that on an intrapersonal cognitive level social comparison plays a role in (dis)similarity judgments on goals associated with certain choices. However, if the aim is to give greater generality to social comparison as the explanatory principle, one should demonstrate its functioning not only on the intrapersonal cognitive level, but also on a behavioral level, not only for the individual but for the interaction between two (or more) individuals as well. That social comparison is important in the behavior of non-interacting individuals was demonstrated by Rijsman (1974), Poppe and Rijsman (in press) and Syroit and Rijsman (in press). The significance of the social comparison motive for two persons interacting with one another was shown in an article by Rijsman and Poppe (1977). They show how Messick and Thorngate's (1967) finding that avoidance of relative loss is a stronger motivational force than approach to relative gain, and how Marwell, Ratcliff and Schmitt's (1969) finding that choices in a MDG can be based upon equity motives, can all be integrated in the social comparison model. Rijsman and Poppe further describe a study in which predictions on choices in a MDG are deduced from social comparison theory. The matrices they employ are shown in Figure 4-1.

An inspection of the structures (matrices) in Figure 4-1 shows that Person A in matrix 8/6 is in a favorable position. He always receives 2 units more than B for a corresponding choice. That means that Person A may easily obtain a lead in the outcomes, whereas B may obtain a backlog.

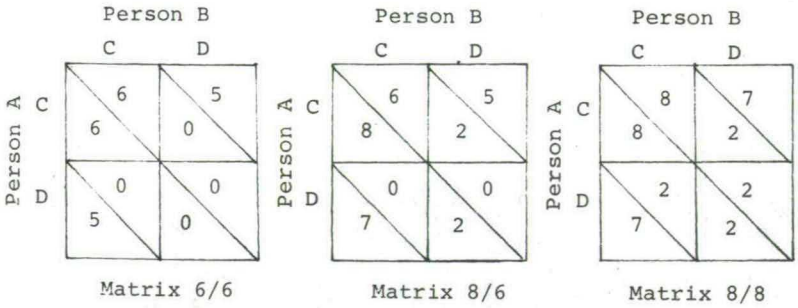


Figure 4-1. Matrices 6/6, 8/6 and 8/8.

Within the framework of Rijsman's comparison model this implies that Person B will relatively often choose alternative D, which sets bounds to his backlog. Person A can choose alternative D less often. Were he to choose D too often, he might obtain a lead exceeding the limits of comparability. That means that B will make more D-choices than A. The persons in the symmetrical matrices 6/6 and 8/8 will continuously try to obtain a lead in total score, or eventually try to eliminate a backlog. The result will be a great number of D-choices. The findings of the experiment, reported by Rijsman and Poppe, were in accord with these deductions from the social comparison model. Choosers in the superior position in the asymmetrical 8/6 matrix made a D-choice in 52.5% of their choices, whereas choosers in the inferior position did so in 66.0% of their choices. The percentages of D-choice in the 6/6 and 8/8 matrices were respectively 77.0 and 81.5. It thus follows from this study that social comparison takes place as to the outcomes determined by the entries of the matrix and by the choices made by subjects within the framework of that matrix. In this chapter we will investigate whether social

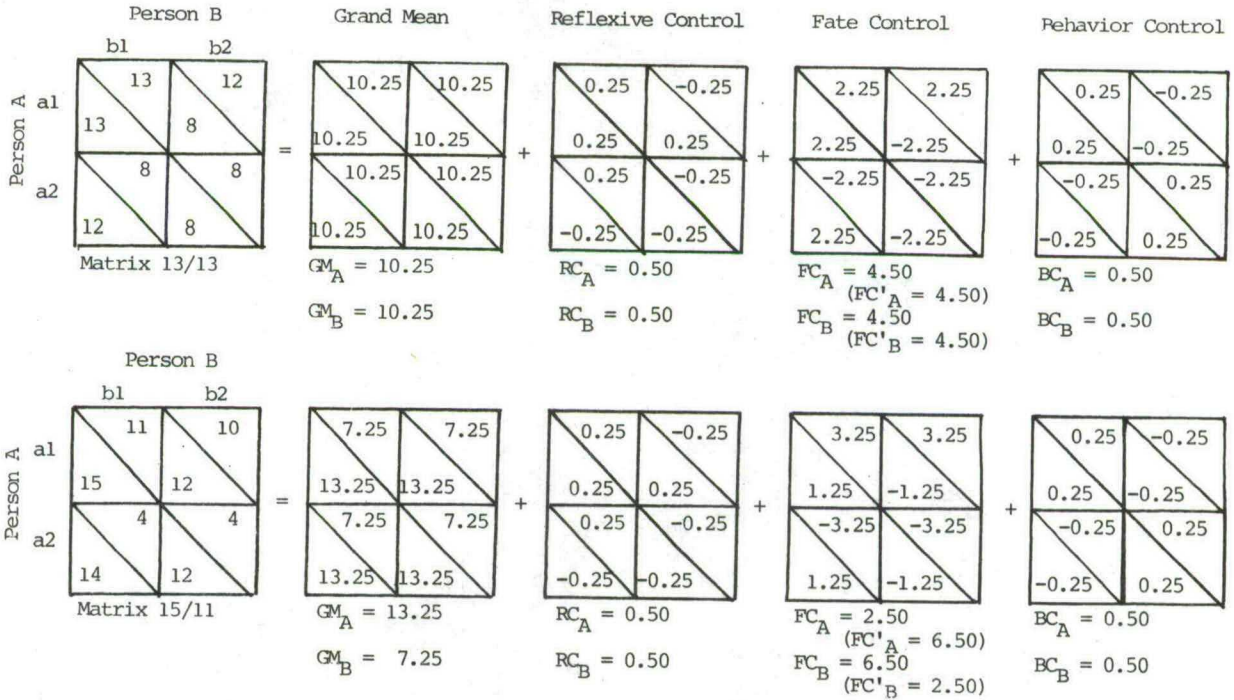
comparison also applies to the cell entries of the matrix themselves. We will do that by checking whether subjects do actually and systematically change the cell entries when given an opportunity to do so. Before clarifying the meaning of social comparison theory in this domain, it is necessary first to make an analysis of the components out of which the matrix has been built up.

As far as we know, the only experiment reported in the literature in which changes in the matrix entries are used as a dependent measure, is the experiment of Slack and Cook (1973). They composed three kinds of subject couples: both subjects a high F-score (high authoritarianism), both a low F-score, or one with a high and the other a low F-score. All couples were presented the same PDG matrix whose entries they could change according to certain rules. Slack and Cook found in this exploratory study that the three groups of subjects differed on the indices which could be deduced from the changed matrices. Here, we are most interested in the sort of indices which were used. The more important of these indices also appear in the very detailed analytical framework described by Kelley and Thibaut (1978). They analyze the matrix entries in a number of components. We will describe these components by means of the matrix 13/13 in Figure 4-2.

The analysis is done separately for each of the two persons. In the outcomes for a certain person we first of all discern a general mean. Kelley and Thibaut call this the Grand Mean (GM). GM for Person A in matrix 13/13 is (13+8+12+8)/4 = 10.25.

A second component discerned by Kelley and Thibaut is the Reflexive Control (RC), that is the control which a person exerts upon his own outcomes. Person A in matrix 13/13 can obtain an average of (13+8)/2 = 10.50 units with alternative a_1, and an average of (12+8)/2 = 10.00 units with alternative a_2. The RC is therefore 10.50 - 10.00 = 0.50. In each of the cells of the favorable alternative a_1 0.25 is entered for A,

Figure 4-2. Matrices 13/13 and 15/11 and the decomposition in components according to Kelley and Thibaut (1978).



whereas in each of the cells of the unfavorable alternative a_2 -0.25 is entered.

Besides A himself, B also exerts a certain control upon the outcomes which A can achieve. This is indicated by Kelley and Thibaut as Fate Control (FC). When B chooses b_1, then A gets an average of (13+12)/2 = 12.50 and if B chooses alternative b_2, then A gets an average of (8+8)/2 = 8.00 units. FC for A is therefore 12.50 - 8.00 = 4.50. In each of the cells of the favorable alternative b_1 2.25 is entered for A and -2.25 in each of the cells of the unfavorable alternative b_2.

GM, RC and FC together do not yet form the total matrix which is to be analyzed. The difference is shown in the last partial matrix and is indicated as Behavior Control (BC). Behavior Control is the joint influence which A and B can exert upon the possible outcomes for one person. In order to achieve an entry of 0.25 for BC, A must choose a_1 when B chooses b_1, or a_2 when B chooses b_2. BC for Person A is 0.50.

The analysis for Person A in matrix 13/13 is shown in Figure 4-2. This same figure also shows the components into which matrix 15/11 can be analyzed for each of the two persons.

In Kelley and Thibaut's analysis, FC refers to the influence which the other can exert upon the possible outcomes for a given person. In this chapter, however, we start from the opposite perspective and use the term FC', which refers to the influence which a given person can exert upon the possible outcomes for the other. Thus RC, FC' and BC, respectively stand for the influence which a person has upon his own outcomes, upon the outcomes for the other and, together with the other, upon his own outcomes.

Slack and Cook (1973) indicate GM, RC and FC', respectively as Environmental Wealth, Power of Economic Self Control and Power of Economic Other Control. Kelley and Thibaut also explain the meaning of the relations between those components. For example,

RC and FC are concordant in the matrices of Figure 4-2 because the most favorable choice of RC for one person is at the same time the most favorable choice for the other. As can be seen in Figure 4-2, A and B also have a certain amount of Behavior Control over each other. This is indicated as Mutual Behavior Control (MBC). In matrix 13/13 Mutual Behavior Control is correspondent. This stems from the fact that the cell entries for BC are positively correlated between the two persons. Although the qualitative properties (like concordance and correspondence) are essential for full understanding of the matrix, in this study attention is restricted to the changes which the subjects bring about in the components. The reason is that these components can actually serve as a basis for social comparison between the subjects. Moreover, the qualitative properties of a matrix can only be changed via a change in the cell entries of the matrix, and such changes necessarily imply changes in the components of the matrix.

Figure 4-2 not only comprises the analysis of the symmetrical matrix 13/13, but also of the asymmetrical matrix 15/11. Part of the subjects was given matrix 13/13 and an other part matrix 15/11. All subjects received an opportunity to change the matrix. In each of the 10 trials of the experiment, subjects were allowed to change upwards or downwards one of their own cell entries and one cell entry of the other subject. The changes were not fixed, but were restricted to a certain maximum per condition.

On the basis of social comparison theory, it is to be expected that subjects in the superior starting-position in matrix 15/11 (i.e. Person A) will make weaker attempts to improve their GM and FC' than subjects in the inferior starting-position in matrix 15/11 and than subjects in the starting-position of equality in matrix 13/13. The subjects in the inferior starting-position will try to reduce their backlog in GM and FC'. The subjects in the symmetrical matrix will try to reach a better position than their interaction partner in the

matrix with respect to GM, FC' and RC. With respect to RC, the two persons in the asymmetrical matrix are in a position of equality and both will try to achieve a certain advantage in the comparison.

It is very unlikely that social comparison phenomena will show up in the changes in Behavior Control, as this component reflects the influence which the two persons combined have upon the outcomes for one of them. Reflexive Control and Fate Control, too, are more specific components of the mutual relationship than the general mean (Grand Mean) is. Any attempt to change RC or FC' has a direct impact upon GM. How changes in the mutual comparison positions actually take place has to be found out. It is possible, namely, to alter the Self-Other relation for GM, RC and FC' in several ways: adding and/or subtracting units from one's own and/or the other's entries. It is important to know the rules by which the changing of matrix entries was restricted. For some subjects, the changes made by one person to the matrix (to an entry of his own and of the other) were restricted to the same maximum as the changes that the other person could make. In this condition, namely both persons having the same possibilities for making changes, the maximum change per trial was 2 units. Thus each of the two persons could change one of his own entries to the maximum of 2 units and one entry of the other person by a maximum of 2 units. In other conditions, the maxima set were 3 for one person and 1 for the other, so that one person had superior possibilities of changing than the other, who had inferior possibilities.

The two variables, starting-position and changing possibilities, were put together in a 3 x 3 design represented in Table 4-1. The symbols which are used in Table 4-1, and which are also used later in the text, are to be read as follows: The first letter stands for starting-position and the second for the changing possibilities, with I meaning Inferior, E meaning Equal, and S meaning Superior.

Starting-position

Changing possibilities	Inferior I	Equal E	Superior S
Inferior I	II*	EI^{x}	SI^{+}
Equal E	IE^{o}	EE	SE^{o}
Superior S	IS^{+}	ES^{x}	SS*

* Condition II is related with condition SS
^{o} Condition IE is related with condition SE
$^{+}$ Condition IS is related with condition SI
^{x} Condition EI is related with condition ES

Table 4-1. Design of 9 Conditions.
(The first letter of the indices stands for the starting-position and the second for the possibilities to change the matrix)

It should be noted that the 9 conditions are not independent. Dependency relations exist between the conditions II and SS, between IE and SE, between IS and SI, and between EI and ES.

The hypotheses formulated above on the effects of equality or inequality between the two persons refer to the "starting-position" variable. The "changing possibilities" variable was

added for exploratory purposes.

4.2. Method

4.2.1. Subjects

Participants in this experiment were 100 female students (ages between 16 and 18 years) of a Domestic Science School in Diest (Belgium). They participated in the experiment in dyads. Within the dyads the following conditions were combined: one subject in condition II and the other subject in condition SS; one in IE and the other in SE; one in IS and the other in SI; one in EI and the other in ES. Only the EE subjects were confronted with a subject in the same condition. In this latter condition 10 dyads were run. In each of the other 8 conditions 10 subjects were run. Thus, there were five kinds of sessions in this experiment, and each kind was run 10 times. The subjects were randomly distributed over the conditions.

4.2.2. Procedure

The two subjects were seated next to one another at the same side of a table, partitioned so that they could not see each other nor observe one another's activities. Each subject had a matrix before her which was either identical (qua shape and entries) with matrix 13/13 (equality starting-position) or with matrix 15/11 (unequality starting-position). The only difference from the matrices discussed thus far was that persons A and B were denoted respectively as persons One and Two, the alternatives a_1 and a_2 respectively as A and B, and the alternatives b_1 and b_2 respectively as X and Y.
The experiment was conducted by five (male) experimenters each of whom ran two of the five different kinds of sessions.
The instructions were given on tape. The instructions for the II and SS conditions, are given below as an illustration.

> "I would like to ask you to listen carefully to the instructions. Would you please from now on stop speaking, either to yourself or anyone else.

What you are participating in is an experiment on how people behave in certain game situations. We will thus ask you to play a certain game according to some rules which will be explained to you. A game means among other things, that you can gain points or a certain prize. As we will soon explain, you will be able to gain points in this game.

One of you is player One and the other is player Two. Whether you are player One or Two is shown on a slip of paper before you. The reason why one of you is player One and the other player Two is purely incidental, and depends upon the random seating arrangements.

Each of you has two cards. Player One has cards A and B, and player Two cards X and Y. In each game trial you will have to show one of your two cards to the experimenter, so that the other player cannot see which one. The points you gain depend upon what you both choose in one trial.

Look at the point card in front of you. This card is divided into four squares. In each square the points for player One are at the left side of the slant line and those for player Two at the right side.
Thus, for example, when player One chooses A and player Two X, then you are in the upper left square of the card, which means that player One gets 15 points and player Two 11 points.
If, for example, player One chooses A and player Two Y, then you are in the upper right square of the card, which means that player One gets 12 points and player Two 10 points.
If, for example, player One chooses B and player Two X, then you are in the lower left square of the card, which means that player One gets 14 points and player Two 4 points.
If, for example, player One chooses B and player Two Y, then you are in the lower right square of the card, which means that player One gets 12 points and player Two 4 points.

During the whole game the total score of each player will be recorded separately and the experimenter will inform both about the scores after each trial."

Following upon these instructions, four exercise trials were run (AX, AY, BX and BY). Then, when normally such an experiment starts, the instructions proceeded:

"As you can see, the points on the card are very important for the scores you can get. These points, however, were chosen randomly, and you are allowed to change them in the following way.

Player One can change one of the numbers which are left of the slant line in one of the four squares. He can do that, completely at his own choice, by either adding 1, 2 or 3

points to that number or by subtracting 1, 2 or 3 points from the number. He can also leave the numbers unchanged if he wants. In addition, he can also change one of the numbers to the right of the slant line in one of the four squares. Here, too, he can maximally add or subtract three points from the number, or leave the numbers unchanged.

Player Two can change one number left of the slant line in one of the four squares by maximally 1 point, or leave the numbers unchanged. In addition, he can also change one number at the right-hand side of the slant line in one of the four squares by adding or subtracting 1 point. He may also leave the numbers unchanged.

Thus, each of you can change two numbers on the card, one left of and one right of the slant line. The two numbers do not have to be in the same square. It is always so, however, that one of the numbers can influence your own score and the other number affects the score of the other player. But as has already been said, you can even leave one or both numbers unchanged.

The fact that player One can change the numbers by maximally 3 and player Two by maximally 1, corresponds with your choice of seats. Had you chosen your seats differently, you would have had the opposite situation.

Player One can indicate the changes he wants to make by writing +3, +2, +1, -1, -2, -3 after the number on the card. You can, if you want, leave the numbers unchanged. Player Two can indicate the changes he wants to make by writing +1 or -1 after the number he wants to change. He, too, can leave the numbers unchanged, if he wants.

When you have done that, you give your card to the experimenter. He will use your changes to make up a new card, which he will then give back to you. You can then start again making changes to the card in the same way as just described. That same procedure will be repeated a number of times. The final card obtained in that way will be used to play the actual game, as I explained to you at the very beginning."

The number of trials during which the subjects could change the card in the way described above was actually 10. The subjects were not told this number beforehand.

Depending upon the starting-position, the instructions referred to the matrix entries on matrix 15/11 (conditions IE and SE, IS and SI, II and SS) or the entries on matrix 13/13 (conditions EI and ES, or EE and EE) of Figure 4-2. Also depending upon the changing possibilities, the instruction spoke of changes by maximally 3 (superior changing

possibilities), by maximally 1 (inferior changing possibilities), or maximally 2 (equal changing possibilities).

After the 10th trial the experiment was explained and the subjects were sworn to secrecy.

4.3. Results

It was first determined by how much each subject changed his own and the other person's GM, FC' and RC values per trial. These change scores were put into an analysis of variance with "starting-position", "trials", and "self vs other" as independent variables. In so doing the following restrictions were taken into account:

a. For the sake of homogeneity of variance, no conditions with different changing possibilities were put into one analysis.
b. Because the scores of the conditions IE and SE are correlated with one another, but are uncorrelated with the scores of the EE condition, those three conditions were compared by means of paired comparisons between conditions.
c. Each condition has 10 subjects, except condition EE which has 10 dyads. In this condition, the mean of the two subjects in a dyad was taken as the score.

This resulted in five clusters of analyses:

1. II with EI and SI
2. IE with EE
3. IE with SE
4. EE with SE
5. IS with ES and SS.

The analyses are fully represented in Appendices 4A to 4E, inclusive.

Since there are three independent variables per analysis, each ANOVA produces 7 testable portions of variance. As one can see in Appendices 4A to 4E inclusive, only one of the 35 portions of variance in the 5 ANOVAs, using RC as dependent variable,

is significant at the 5% level. This is less than one can expect on the basis of chance. The only significance ($p < 0.05$) concerns the starting-position in the IE with EE analysis. It appears that the person with an inferior starting-position builds up higher RC values for himself and for his partner than a person in a condition of equal starting-position.

A similar situation shows up in the analyses with FC' as dependent variable. Here, too, only one of the 35 testable portions of variance is significant ($p < 0.05$). It is the portion concerning the effect of trials in the IS, ES and SS analysis. The subjects in those conditions show rather unsystematic variations over trials in the extent to which they change their own Fate Control over the other plus the Fate Control of the other over themselves.

Many more systematic variations are found in the extent to which subjects change the General Mean (GM) of their own matrix entries and the matrix entries of their partner. Those variations for self and other per starting-position and per trial are shown in Appendices 5A to C inclusive and in Figure 4-3. Table 4-2 gives an overview of the significant portions of variance.

	II, EI and SI	IE and EE	IE and SE	EE and SE	IS, ES and SS
A = starting-position					
B = trials					
C = Self/Other	$p<0.001$	$p<0.001$	$p<0.05$	$p<0.01$	$p<0.001$
A x B			$p<0.05$		
A x C			$p<0.01$		$p<0.01$
B x C	$p<0.05$	$p<0.05$		$p<0.01$	
A x B x C			$p<0.05$		$p<0.05$

Table 4-2. Overview of significant portions of variances of ANOVAs of change in GM.

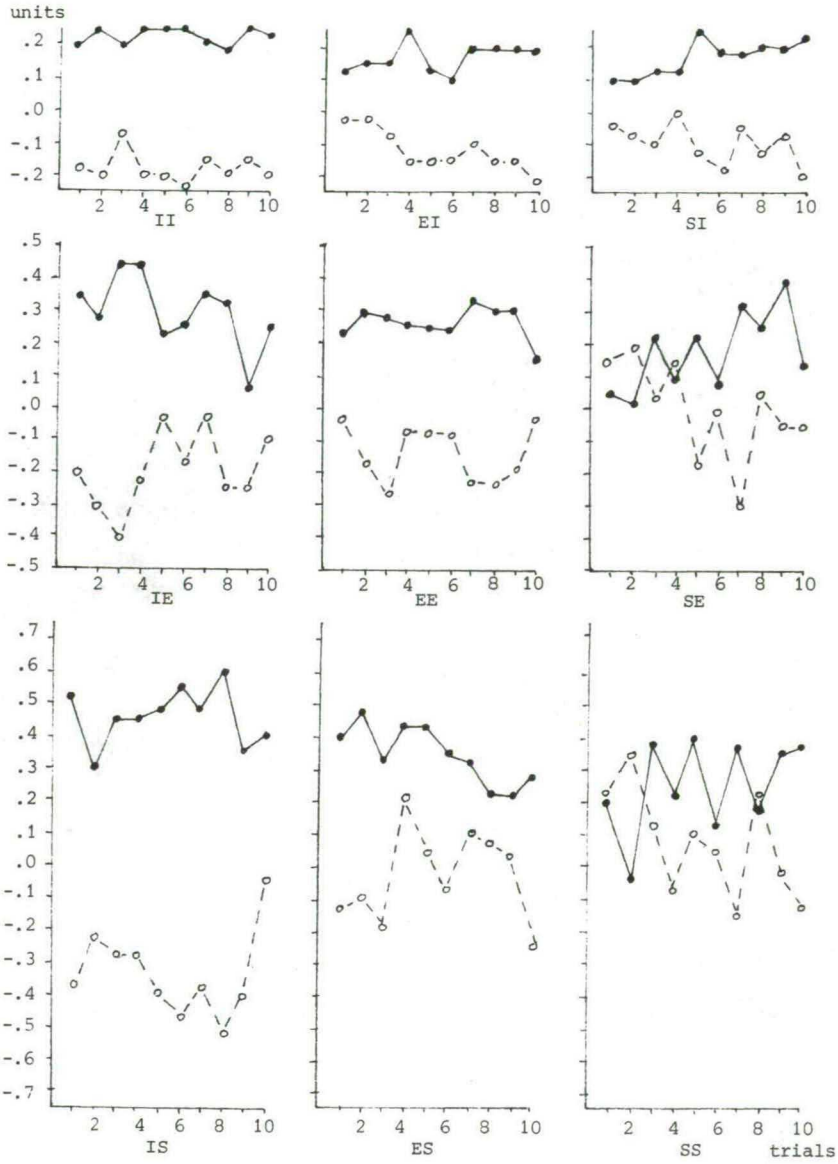


Figure 4-3. Changes in GM of Self (•——•) and Other (o--o), by starting-position, by possibilities to change and by trial.

The meaning of the variable "self vs other" is apparent from the data in the tables, figures and analyses. In all five analyses, "self vs other" produces a significant main effect: in each case, a subject gives more to himself than to his partner. This general pattern, however, can be differentiated in some important respects. Subjects in the SE and SS conditions give more to their partner than to themselves in the first trials. This produces some significant interactions in the analysis involving IE and SE, namely an interaction between starting-position and self vs other ($p < 0.01$), between starting-position and trials ($p < 0.05$) and between starting-position and trials and self vs other ($p < 0.05$). The same three-way interaction ($p < 0.05$) and an interaction between starting-position and self vs other ($p < 0.01$) is found in the analysis of the conditions with superior changing possibilities. As appears from Figure 4-3, the gap between what subjects with inferior changing possibilities give to themselves and to their partner increases over trials. This corresponds to a significant interaction ($p < 0.05$) between trials and self vs other in the analysis involving conditions II, EI and SI. A similar significant interaction ($p < 0.05$) is found in the analysis involving the conditions EE and SE. There, too, the discrepancy between what one gives to own and to the other increases over trials (except in the very last trial no. 10). In contrast, however, the same significant interaction ($p < 0.05$) in the analysis involving conditions IE and EE stems from the fact that the discrepancy between what one gives to own and to the other is greater in the first couple of trials than at the end. In the two latter analyses, the major contribution to interaction effects comes from respectively SE and IE, but this does not result in significant second-order interactions.

4.4. Discussion

The general pattern of results concerning the changes in GM corresponds fairly well with the predictions of social

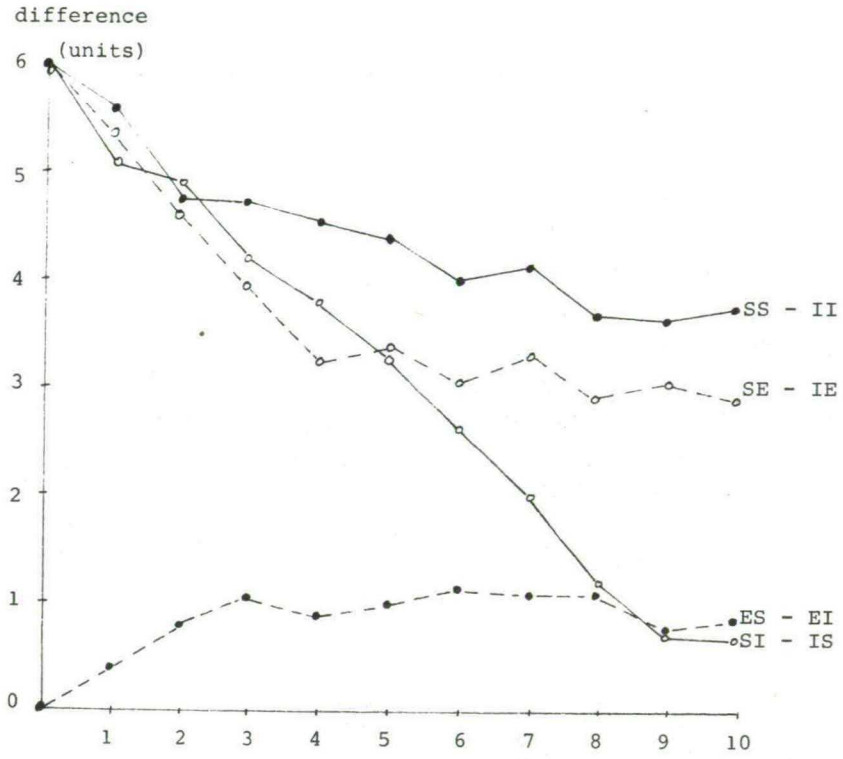


Figure 4-4. Difference between GMs of two subjects in a dyad.

comparison theory. The kind of influence the changes have upon the differences in GM between the two persons in a dyad, is shown in Figure 4-4. It is found that the GM differences of the SS and II conditions and the GM differences of the SE and IE conditions remain rather stable from the 8th trial on. The former difference stabilizes at about 3.75 and the latter at about 3.0 units. The GM difference of the ES and EI conditions stabilizes at about 1.0 from the 3rd trial on. This means that the SS and SE subjects concede part of their GM advantage. They do this by in fact giving somewhat more to the other than to themselves in the first trials. In the

subsequent trials they take less away from their partner than their partner gives to himself, and they give less to themselves than their partner takes away from them. Then at a certain point of difference (smaller than at the beginning), a balance between give and take appears. A subject in the EI condition continuously gives to himself and takes away from his partner. That subject's partner, however, who has superior changing possibilities, causes a slight difference in the first trials by giving to himself and taking away from the other, but when he has attained a lead of about 1.0 GM difference, the lead is further maintained at that level. An IS subject uses all means (give to himself and take away from the other) to improve his inferior position, but his SI partner defends himself against these efforts with the same sort but less forceful means. Taken together, the SI subjects do not manage to transform their position backlog into a lead. Between the 9th and 10th trial, the GM difference does not change any more. It is not clear whether this means that the difference really stabilizes at that level, or that the number of trials is too small to observe a further change. We should have had more trials in that condition in order to be able to decide on that.

The EE subjects continuously give to themselves and take away from their partner. However, because they give more to themselves than they take away from the other, their own GM increases, namely from 10.25 to 11.52. The GMs of the EI and ES subjects increase to 11.70 and 12.50. In the conditions of an inferior starting-position, which means a GM of 7.25 to start with, the GM increases to 10.20, 10.20 and 10.85 for subjects whose changing possibilities are respectively inferior, equal or superior. In the superior starting-position conditions, which means a GM of 13.25 to start with, only the GM of subjects with superior changing possibilities increases, namely to 13.95. The GM of subjects with equal changing possibilities remains essentially unchanged (13.20), whereas for subjects with inferior changing possibilities it drops

to 11.55.

We can thus conclude that the subjects actually regulate their give-and-take behavior so that the resulting changes in GM are quite predictable from social comparison theory.

That conclusion does not apply to changes in Reflexive Control (RC) and Fate Control (FC). There are hardly any systematic differences between conditions for those two components of the matrix. This implies, of course, that there are also no systematic changes between conditions in the qualitative differences of the matrix, which are related to those components.

In other words, the subjects have effectuated a comparison on the immediately evident aspects of the matrix (GM) and not on the functional aspects, resulting from their changes. What Kelley and Thibaut (1978) note in the first page of their book, may thus actually have been due to: "The nature of the interdependent relationship is not always fully understood by the participants". It might have been different if the subjects had not only had a chance to change the matrix, but had also had a chance to interact actually with their partner, or play actually the game. It is indeed impossible to compare on dimensions into which one has no insight.

CHAPTER 5

THE EFFECTS OF CHOICES AND OUTCOMES UPON BEHAVIOR IN A PRISONER'S DILEMMA GAME

5.1. Introduction

It has been shown in several studies that social comparison plays an important role in the behavior in mixed-motive games (McClintock and McNeel, 1966a, b; McClintock and Nuttin, 1969; Carment, 1974; Toda, Shinotsuka, McClintock and Stech, 1978). In all these studies, done in different countries and with subjects of different ages, it was consistently found that subjects make more competitive choices in a MDG when they get feedback about their own and the other person's cumulative score than when they only get feedback about their own cumulative score. Messick and McClintock (1968) found the same in some types of decomposed games. Gallo, Irwin and Avery (1966), using a MDG, and Tedeschi, Lesnick and Gahagan (1968), using a PDG, manipulated four different feedback conditions in their experiment: no feedback about cumulative score; only feedback about one's own cumulative score; only feedback about the other's cumulative score, feedback about both one's own and the other's cumulative score. Their findings indicate that feedback about the other's cumulative score leads to more competitive choices (D-choices) than feedback about one's own cumulative score.

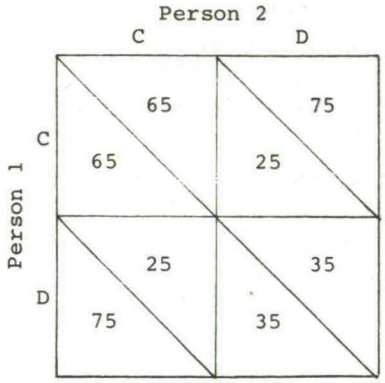
All the experiments cited were done with symmetrical matrices. Their results can be understood in terms of social comparison theory. When subjects are informed about the other's (and their own) cumulative score, the tendency to avoid a backlog and to achieve a (moderate) lead is reinforced. Therefore, feedback about the other's and about one's own cumulative score, leads to more competitive choices than feedback only about one's own cumulative score.
As mentioned in the previous chapter, the effects of comparison between one's own and the ohter person's

(cumulative) scores were investigated too by Messick and Thorngate (1967), Marwell, Ratcliff and Schmitt (1969) and Rijsman and Poppe (1977). It was found in all these studies that outcomes were an effective and important determinant of choices made by the subjects.

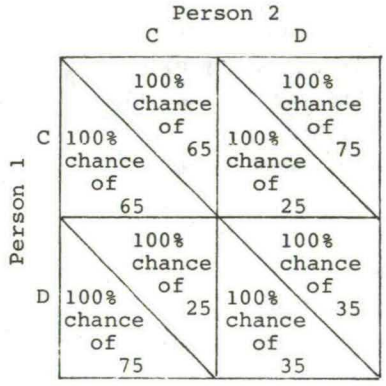
Besides the outcomes, obtained in a previous trial, there are still other factors which can determine a subject's next choice. One of them can, for example, be that a subject, after observing the other one's choices, attributes certain intentions to the other (see for example Kelley and Stahelski, 1970a) and reacts to those attributed intentions. Another example of the fact that choices should not be only determined by outcomes in the previous trial is strategic choice behavior.

In the PDG and MDG used, it is impossible to disentangle the effects of outcomes in the last trial from effects of choice per se in the last trial. It has always been the case that a specific choice coincidence fully determined what one's own and the other person's outcomes would be. This is due to the fact that only "utilities" are included in the matrix. However, one can also consider the entries in the matrix, not as deterministic values but as expected utilities, i.e. as outcomes which can be obtained with a certain probability. Let this be illustrated by means of the matrices in Figure 5-1.

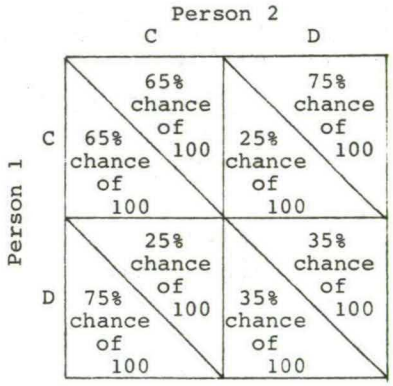
A PDG matrix as matrix (1) is generally conceived as matrix (2) in this figure: the choice coincidences always lead to some outcomes. The probability in all the cells of the matrix is the same, namely 100%. Only the outcomes vary over the cells. However, it is also possible to keep the outcomes constant over the cells, and to vary the probabilities with which those outcomes can be obtained over the cells. That is done in matrix (3) of Figure 5-1. The expected utilities of matrix (2) are the same as those of matrix (3).



(1)



(2)



(3)

Figure 5-1. Deterministic (2) and Probabilistic (3) version of PDG matrix.

It is open to doubt, however, whether the two matrices are psychologically equivalent to each other.

We introduce the probabilistic interpretation of the PDG

matrix because this approach allows the effects of choices per se and the effects of outcomes to be disentangled to a certain extent. Indeed, if both subjects choose C a great number of times, each of them would get 100 units after 65% of the choices and nothing in 35% of the choices, but it is not the case that getting either outcome necessarily coincides for the two subjects. Statistically, getting 100 units will coincide for the two subjects in 45.25% of cases, and getting nothing at all in 12.25% of the cases. In 22.75% of the cases, one subject will get 100 units while the other one gets nothing and similarly, in 22.75% of the cases one will get nothing while the other subject gets 100.

In order to measure the relation between choice or outcomes on the one hand and behavior on the other, some indices devised by Rapoport and Chammah (1965) can be borrowed. They describe a number of "state conditioned propensities". A state-conditioned propensity is a person's probability of choosing cooperatively (C) after a specific choice coincidence at the previous trial. For example, P(C/CD) is the person's probability of choosing C after a trial in which he himself chose C and the other D. Usually, that is in a deterministic PDG, the so-called "state" is formed by both choices and outcomes. In a probabilistic PDG, however, the symbol P(C/CD) only refers to choices. We will therefore call these conditioned propensities "choice-conditioned propensities". Analogous to the "choice-conditioned propensities" one can define an "outcome-conditioned propensity": a person's probability of choosing C after a specific outcome coincidence on the previous trial. For example, P(C/+-) refers to a person's probability of choosing C after a trial in which he himself was rewarded, but the other person was not. It is also possible to determine a person's probability of choosing C after specific coincidence of choices and outcomes in the previous trial. For example, $P(C/C^{+}D^{-})$ refers to a person's probability of choosing C after the trial in which he himself chose C, and was rewarded for it, and the other person chose

D without being rewarded for it.

Altogether there are 4 choice-conditioned, 4 outcome-conditioned and 16 choice-outcome-conditioned propensities. In the first two types of conditioned propensities, the effects of choices and outcomes are only partially separated, and not yet fully. The latter is only achieved in the choice-outcome-conditioned propensities. Thus, only by using this most refined type of conditioned propensity will we be able to weight the relative importance of choices and outcomes. If social comparison takes place, then choice behavior should be contingent on outcomes. Comparison, indeed, only takes place in a quantitative or quantifiable dimension (eventually of an ordinal kind). In the present experiment we will investigate whether behavior is more contingent on outcomes than on choices. For that purpose we will use a matrix, that is matrix (3) in Figure 5-1. In addition we will also run a condition with matrix (2) of Figure 5-1.

When "contingency on outcomes" is mentioned, it should be borne in mind that this must be contingency on the outcomes of the subject himself and at the same time on those of the other person. If it is found that the choices are only contingent on the outcomes of the subject himself, then it could mean that the "win-stay, lose-change " principle is playing a role.

In the classical deterministic version of the PDG, a subject who gets feedback about his own and the other's outcomes, can determine with full certainty what the other one has chosen in that trial. In the probabilistic version, on the other hand, it is possible to give outcome feedback without allowing the subject to determine with full certainty what the other person has chosen. (The subject may determine, however, on a basis of both his own choice and the outcomes, what the most probable choice of the other person was). One may assume that the contingency on outcomes will be stronger when one does not know what the other person's choice was, then if the other

person's choice is known. To follow this up, we shall create a condition making use of the probabilistic version of the matrix in which the subjects get no feedback on the choices made.

In the experiment three conditions are broached:

I: the deterministic version of the PDG

II: the probabilistic version of the PDG with feedback on the choices made

III: the probabilistic version of the PDG without feedback on the choices made.

In all three conditions there is continuous feedback regarding scores and totals of both persons.

It is difficult to predict the conditions in which there will be more C-choices made. On the one hand the probabilistic character of the matrix in conditions II and III causes more uncertainty than the deterministic character of the matrix in condition I. This could cause fewer cooperative (C) choices in conditions II and III than in condition I.
On the other hand, owing to the probabilistic character of the matrix in conditions II and III, one of the subjects in the dyad could gain a certain lead by chance. When this lead is big enough, it could lead to more C-choices in these conditions in comparison with condition I.

5.2. Method

5.2.1. Subjects

56 male, first-year psychology students of the Katholieke Hogeschool at Tilburg took part in the experiment. They had all volunteered as subjects for an experiment on "choice-behavior". Twenty-eight pairs of subjects were formed at random. The participants in each pair came from different study groups, so that they did not know each other very well. In one pair, one of the participants knew about the Prisoner's Dilemma Game. Consequently, the results of this

pair were not included for analysis.

5.2.2. Procedure

In each session 2 subjects were placed separately in sound-proof cabins. Each cabin contained a headphone, a card with matrix (1) from Figure 5-1, and a box with 2 buttons (C and D)[1]. Through a window in the cabin the subjects could see a video monitor.

After the subjects had seated themselves in the cabins they heard the following instructions through the headphone:

> "Please, listen attentively to the instructions.
> You are taking part in an investigation into choice and decision behavior. You are asked in this experiment to make a number of choices.
>
> As you know, you are taking part in this experiment two at a time. One is sitting in cabin 1 and the other in cabin 2. Thus we shall address you both, as person 1 and person 2, respectively. For complete certainty you see before you a card indicating whether you are person 1 or 2.
> It is the intention that in a few moments, person 1 and person 2 will simultaneously make a number of choices between alternatives C and D. The small box with two buttons and two small lamps in front of you serves to indicate your choice. As you see, the left-hand button and left-hand lamp are indicated by the letter C and the right-hand button and lamp by the letter D.
>
> With every choice you can get a number of points which represent a certain amount of money. For every 100 points that you get you will be paid 4 (Dutch) cents at the end of the experiment. The number of points that you get is dependent upon what you yourself have chosen and on what the other person has chosen. The point card that you see on the table in front of you will serve to make this clear. This card contains 4 compartments. In each compartment you see the scores of person 1 in the bottom left-hand corner under this slant line, and in the top right-hand corner above the slant line the scores of person 2."

---

1) Footnote: These buttons were indicated as "A" and "B". "A" and "B" were also spoken of in the instructions. In this report "A" and "B" are replaced by "C" and "D", respectively in order to fit them better to the names used in the literature, "Cooperation" and "Defection".

After this, the instructions varied per condition. In condition I the instructions proceeded as follows:

> "On the card on the table before you, you can see how many points you can get. The number of points you can get in a trial depends upon the choices that you both make simultaneously. On the card you see four compartments. In each compartment the points for person 1 are on the left-hand side under the slant line and those of person 2 on the right-hand side above the slant line. Thus, for example, if person 1 chooses C and person 2 also chooses C, then one finds oneself in the upper left-hand corner of the card, that means that person 1 gets 65 points and person 2 likewise gets 65 points. If person 1 chooses C, for example, and person 2 chooses D, then one finds oneself in the bottom right-hand corner of the card which means thus, that both person 1 and person 2 each get 35 points. What each of the two have chosen and the number of points each participant got, will be reported after every trial by the experimenter via the television screen that you see outside in front of the cabin window. Likewise the total score for each participant will be reported. Let us demonstrate this by means of four exercise trials."

After this four exercise trials were held (CC, CD, DC and DD). After these were finished the first trial started. The beginning of each trial was indicated by a peep-sound.

The instructions in conditions II and III were identical with one another except for a few communications which were not mentioned in condition III. These communications will hereinafter be placed in brackets [ ]. After the general introduction, the instructions in conditions II and III proceeded as follows:

> "In each trial you have a chance of getting 100 points. On the card on the table in front of you, you can see how great the chance is of getting 100 points. How much chance you have of getting 100 points in the trial depends upon what you both simultaneously choose. On the card you see 4 compartments. The chances of person 1 are in the left-hand bottom corner under the slant line, and those of person 2 are in the upper right-hand corner above the slant line. Thus, for example, if person 1 chooses C and person 2 also chooses C, then both will find themselves in the upper left-hand corner of the card, which means that person 1 has a 65% chance to get 100 points and likewise, that person 2 also has a 65% chance to get 100 points.
>
> If, for example, person 1 chooses C and person 2 chooses D, then both find themselves in the upper right-hand

corner of the card, which means that person 1 has a 25% chance of getting 100 points and person 2 a 75% chance of getting 100 points. If, for example, person 1 chooses D and person 2 chooses C, then both find themselves in the bottom left-hand corner, that means that person 1 has a 75% chance and person 2 a 25% chance of getting 100 points. If person 1 chooses D and person 2 also chooses D, then both find themselves in the bottom right-hand corner of the card, meaning that person 1 then has a 35% chance of getting 100 points and likewise, that person 2 has a 35% chance of getting 100 points.

Whether or not, one can get 100 points on the basis of the chance percentage, is specified with the help of the chance tables with random numbers that are on the table in front of the experimenter. The chance table is used in every trial for each of the persons. The chances that each person has, are thus dependent of each other in the sense that if, for example, both have the same percentage of chance to get 100 points, sometimes one will get the 100 points and the other not, while in another trial the opposite can occur. If one has a certain percentage of chance to get 100 points, that does not in fact mean that one will get the 100 points. However, it is true that the greater the percentage of chance, the greater the chance is that you will get the 100 points.

After every trial the experimenter will indicate upon the monitor screen that you see in front of the window of the cabin [what each of you has chosen and]whether one or both have obtained 100 points. Likewise the total scores of each will be reported. Let us demonstrate this by means of four exercise trials.

Would persons 1 and 2 please choose C. Press the left-hand button. [The experimenter now notes on the screen that persons 1 and 2 have chosen C.] According to the chance tables in this trial each of the two should get 100 points. This is also noted upon the screen. The total is thus 100 points for each.
Would person 1 now choose C and person 2 choose D. Then press the button .... [Now C is noted under "person 1" and D under "person 2".] According to the chance tables, person 1 should get 100 points and person 2 should get nothing. The totals become 200 and 100 respectively just as you see on the screen.
Would person 1 now choose D and person 2 C. According to the chance tables person 1 should get 0 point and person 2 should get 0 point. The information on the screen is, from left to right: [D, C] 0, 0 and total scores 200 and 100.
Would person 1 now choose D and person 2 also D? According to the chance tables 1 should get 0 point while 2 should get 100 points. The information on the screen is now: [D, D] 0, 100, 200, 200.

These were the 4 exercise trials. We now begin the actual experiment. During the actual experiment the beginning of every trial will be signalled by a peep-tone.
The intention is that immediately after every peep-tone you make a choice based upon the rules that have been explained. Take off the headphones and place them on the table in front of you. We shall not need the headphones any further in this experiment. The peep-tones come from one of the small boxes."

After 250 trials the experiment was explained to the subjects and the subjects were sworn to secrecy.

5.3. Results

5.3.1. Percentage Cooperative Choices

The percentages of cooperative choices in conditions I, II and III were respectively 63.9%, 39.0% and 24.1%. The 250 trials per condition were divided into trial blocks of 25 choices. The percentages of C-choices per trial block and condition are shown in Figure 5-2. The ANOVA reveals a significant main effect of conditions ($p<0.01$) and a significant interaction between conditions and trial blocks ($p<0.01$). The three conditions differ significantly from one another ($p<0.05$; I and III: $p<0.01$; Newman-Keuls method).

The significant interaction is caused by different trends of C-choice percentages over trials in the various conditions. In condition I the percentage of C-choices starts at 37% at trial block 1 and it rises gradually to 69% at trial block 4, after which it remains more or less stable. In condition II the percentage of C-choices starts at 46% at trial block 1, decreases to 30% at trial block 4, to rise again to 44% at trial block 10. In condition III the percentage of C-choices continuously decreases from 38% at trial block 1 to 18% at trial block 10.

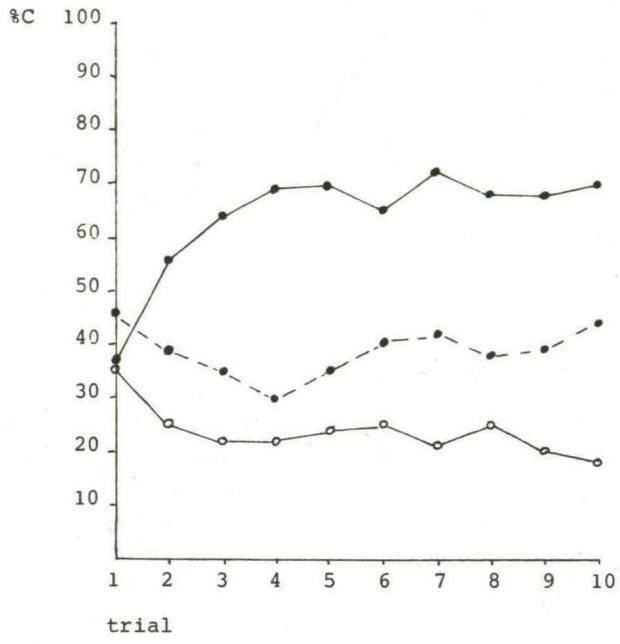


Figure 5-2. Proportion of cooperative choices by 25-trial blocks for deterministic PDG (●——●), probabilistic PDG with (●– –●) and without (○——○) feedback on choice of other person in previous trial.

5.3.2. Choice-conditioned propensities

As already explained, condition II allows us to discriminate between choice-conditioned propensities on the one hand and outcome-conditioned propensities on the other. We start with an analysis of the choice-conditioned propensities of condition II, together with the state-conditioned propensities of condition I.

The mean of the 4 state-conditioned propensities of condition

I is 0.49 and that of the 4 choice-conditioned propensities of condition II is 0.40. As one can seen in ANOVA table 5-2, the difference between these two means is almost significant ($p < 0.07$). That means that the tendency to choose C, independently of one's own and the other person's choice at the previous trial, is slightly stronger in condition I than in condition II. Since there are no further interactions between conditions and propensities, the conditions will be treated together in the remainder of this paragraph.

As one can see in Table 5-1, P(C/CC) is higher than, and P(C/DD) lower than P(C/CD) or P(C/DC), the latter two being almost equal to one another. This leads to a significant main effect of one's own previous C or D-choice ($p < 0.001$) and a significant main effect of the other's previous C or D-choice ($p < 0.001$) upon the next choice. In both cases, the probability of a C-choice after C is 0.55 and the probability of a C-choice after D is 0.34. The interaction between the two variables is also significant ($p < 0.05$).

5.3.3. Outcome-conditioned propensities

Besides the choice-conditioned propensities in condition II, one can also calculate the outcome-conditioned propensities. The latter can also be done in condition III. The mean outcome-conditioned propensity of the PDG with choice feedback (condition II) turns out to be 0.39. When the subjects are not informed about the choice of the other person (condition III), the mean propensity is 0.24. The difference between these two means is significant ($F = 6.03$, df 1/34, $p < 0.05$). There are no significant interactions between conditions and propensities, and therefore conditions will be treated together in the remainder of this paragraph.

It is striking that getting 100 points or not in a trial has hardly any effect upon one's tendency to choose C at the next trial. The probability of choosing C after having received 100 points in the previous trial is 0.32.

Table 5-1. Means of state-conditioned propensities of condition I and choice-conditioned propensities of condition II.

		Other chose C	Other chose D	
Subject chose	C	a *0.69 P(C/CC)	b 0.41 P(C/CD)	0.55
	D	b 0.41 P(C/DC)	c 0.26 P(C/DD)	0.34
		0.55	0.34	0.44

* N = 36

The entries with a different superscript are different from one another ($p<0.05$). (Newman-Keuls method)

Table 5-2. Analysis of variance of state-conditioned propensities (condition I) and choice-conditioned propensities (condition II).

	df	MS	F-ratio
A = deterministic/probabilistic	1	0.336	3.56*
Error between subjects	34	0.095	
B = subject chose C vs D	1	1.673	52.46***
AB	1	0.003	<1
Error B	34	0.032	
C = Other chose C vs D	1	1.667	29.22***
AC	1	0.144	2.53
Error C	34	0.057	
BC	1	0.149	4.46**
ABC	1	0.003	<1
Error BC	34	0.033	
Total	143		

* $p<0.07$ ** $p<0.05$ *** $p<0.001$

The probability of choosing C after not having received 100 points in the last trial is 0.31. Of greater importance is the fact whether or not the other has received 100 points in the last trial. If he did, the subject's probability of choosing C in the next trial is 0.36. If he did not, this probability is 0.27. This difference is significant ($F = 39.93$, df 1/34, $p < 0.001$). There is no significant interaction effect of receiving 100 points or not by self and other.

5.3.4. Choice-outcome-conditioned propensities

In condition II the subjects were told what they themselves and what the other has chosen at the last trial. Owing to the probabilistic character of condition II the information regarding choices is not completely confounded with the information on scores. Therefore, it is possible in this condition to compare the influence of the choices (made by the subjects and the other) at trial n-1 on the chance of a C-choice made by the subject at trial n with the influence of having received 100 points or not by the subject and/or Other at trial n-1 on a C-choice made by the subject at trial n. For this purpose the choice-outcome-conditioned propensities are calculated: the chance of a C-choice at trial n after a C or D-choice made by the subject, for which 100 points have or not have been received and a C or D-choice made by the other, for which he has or has not received 100 points. In all there are 2 x 2 x 2 x 2 = 16 choice-outcome-conditioned propensities that can be distinguished. The average values of these 16 propensities is given in Table 5-3. Table 5-4 contains the analysis of variance.

As described above (results of the state-conditioned propensities of condition I and the choice-conditioned propensities of condition II) the choice of the subject is to a high degree contingent on his previous choice and the previous choice of the other.

Table 5-3. Mean choice-outcome-conditioned propensities of condition II.

		Subject rewarded		Subject not rewarded		Mean
		Other rewarded	Other not rewarded	Other rewarded	Other not rewarded	
Subject chose C	Other Chose C	0.62 **	0.57	0.61	0.73	0.63
	Other Chose D	0.41	0.62 *	0.35	0.51	0.47
Subject chose D	Other Chose C	0.40	0.31	0.30 *	0.28	0.32
	Other Chose D	0.22	0.21	0.24	0.23	0.22
Mean		0.41	0.42	0.37	0.44	0.41

* For two subjects in this condition the actual propensity could not be calculated. These missing data points were (arbitrarity) taken as 0.50.

** N = 18.

If the subject himself chose C at the previous trial, then the probability of his choosing C is 0.55. This is significantly ($p < 0.001$) higher than in the case that he chose D at the previous trial (0.27).

Table 5-4. Analysis of variance of choice-outcome-conditioned propensities of condition II.

	df	MS	F-ratio
Between subjects	17	0.201	
A (Subject C vs D at previous trial)	1	5.636	98.71**
B (Other C vs D at previous trial)	1	1.245	21.80**
C (Subject (not) rewarded at previous trial)	1	0.013	<1
D (Other (not) rewarded at previous trial)	1	0.100	1.75
AB	1	0.071	1.24
AC	1	0.002	<1
AD	1	0.352	6.16*
BC	1	0.022	<1
BD	1	0.186	3.26
CB	1	0.045	<1
ABC	1	0.257	4.50*
ABD	1	0.041	<1
ACD	1	0.003	<1
BCD	1	0.083	1.45
ABCD	1	0.027	<1
Pooled interaction with subjects	225	0.057	
Total	287		

* $p < 0.05$ ** $p < 0.01$

When the other chose C at the previous trial, then the probability of the subject choosing C is 0.48. This is significantly ($p < 0.001$) higher then when the other chose D at the previous trial (0.35). These probabilities are independent of the rewards that the subject and other person got at the previous trial.

One can also examine what the effect is of the subject and the other having or not having received a reward of 100 points at the previous trial, independent of a C or D-choice by the subject and the other at the trial. It appears then that the

above-ascertained (in the results of the outcome-conditioned propensities) influence of having or not having received 100 points by the other has ceased to be a significant main effect in the analysis. Also, having or not having received 100 points by the subject himself, independently of the choices made, appears to have no effect upon the probability with which a C or D-choice is made. However, a few interaction effects of choices made and rewards received were found.

There is a significant interaction effect of the choice which the subject made at the previous trial and the reward obtained by the other at the same trial ($p < 0.05$). If the subject chose D at the previous trial, then it does not matter whether the other did or did not get 100 points. In the first case the probability that the subject continues the series of choices with a C is 0.29 and in the second instance it is 0.26. If the subject chose C at the previous trial, then there is a greater chance that the subject will repeat this C-choice if the other received no reward (0.61) than if the other did receive a reward (0.55).

Apart from this first-order interaction, there is a significant ($p < 0.05$) second-order interaction between the previous choice by the subject, the previous choice of the other and having or not having received a reward by the subject at the previous trial. According to this interaction, after a C-choice made by both the subject and the other the chance of a C-choice by the subject is greater if he has not been rewarded at the previous trial than if he has (0.67 and 0.60 resp.). The chance that the subject chooses C is greater after having received a reward than after having received no reward at the previous trial, if one of the parties involved chose C and the other D (0.51 and 0.43 resp. after a CD-combination and 0.35 and 0.29 resp. after a DC-combination). When both chose D at the previous trial, it does not matter whether the subject has been rewarded or not. The

probability of a C-choice by the subject is than 0.21 and 0.23, respectively.

5.3.5. Own choice/both outcomes-conditioned propensities

Since a subject in condition III is not informed about the other person's choice, it does not make sense to calculate the choice-outcome-conditioned propensities in this condition in the same way as in condition II. It is sensible and possible, however, to make a more differentiated analysis of the outcome-conditioned propensity in condition III than has been done up to now. Indeed, each probability of a C-choice after reward or no reward for both persons at the previous trial can be divided into two cases, one in which the subject chose C and one in which he chose D. Those 8 propensities, to which we will refer as the "own choice/both outcomes-conditioned propensities" are shown in Table 5-5. The left-hand part of Table 5-6 shows the results of the ANOVA on the data. It is found that subjects are much more prone ($p < 0.001$) to choose C when they have chosen C at the previous trial then when they have chosen D at the previous trial (respectively 0.57 and 0.15). The outcomes are important here in the following sense. The probability that a subject repeats a C is relatively small when he himself was not rewarded and the other person was. The probability on the contrary, to choose C after having chosen D, is relatively high for that same combination of outcomes. This produces several significant interaction effects in the ANOVA.

Instead of asking "What is the probability of C after a certain event at the previous trial?" one may also ask "What is the probability that one will repeat his previous choice after a certain event at that previous trial?". To answer that question, we should subtract from 1.00 these entries in Table 5-5 which refer to the C-choice probabilities after a D-choice. The entries in Table 5-5, which are put between brackets, refer to the probability of repeating the previous choice.

Table 5-5. Own choice/both outcomes-conditioned propensities (condition III).

	Self rewarded Other rewarded	Self rewarded Other not rewarded	Self not rewarded Other rewarded	Self not rewarded Other not rewarded	
after C choice	**0.66^{a} (0.66)	0.62^{a} (0.62)	0.36^{b} (0.36)	*0.64^{a} (0.64)	0.57 (0.57)
after D choice	0.13^{x} (0.87)	0.11^{x} (0.89)	0.22^{y} (0.78)	0.13^{y} (0.87)	0.15 (0.85)
	0.39 (0.76)	0.37 (0.76)	0.29 (0.57)	0.38 (0.76)	0.36 (0.71)

* For one subject in this condition, the actual propensity could not be calculated. This missing data point was (arbitrarily) taken as 0.50.

** The entries with a different superscript in each row are different from one another ($p < 0.05$). (Newman-Keuls method).

N = 18

Between brackets: probability of same choice as at previous trial.

The ANOVA on these data is shown in the right-hand part of Table 5-6. It turns out that the subjects are more prone to repeat a D-choice (0.85) than a C-choice (0.57) ($F = 26.70$, df 1/17, $p < 0.001$). The other sources of variance can, under a different label, also be seen in the left-hand part of Table 5-6. Four of the present effects are now significant because a subject is less inclined to repeat his previous choice when the other person was rewarded and he himself not. This is the more so after a C-choice (0.36 versus 0.64) than a D-choice (0.78 versus 0.88).

Table 5-6. Analysis of variance of own choice/both outcome-conditioned propensities (left side) and probability of making same choice as at previous trial (right side), condition III.

	df	MS	F-ratio	df	MS	F-ratio
Error between subjects	17	0.108		17	0.086	
A = after C vs D choice	1	6.430	74.73***	1	2.858	26.70***
Error A	17	0.086		17	0.107	
B = Subject (not) rewarded	1	0.065	1.10	1	0.355	6.12*
Error B	17	0.059		17	0.058	
C = Other (not) rewarded	1	0.039	1.35	1	0.290	15.63**
Error C	17	0.029		17	0.019	
AB	1	0.355	6.12*	1	0.065	1.10
Error AB	17	0.058		17	0.059	
AC	1	0.292	15.80**	1	0.039	1.37
Error AC	17	0.018		17	0.029	
BC	1	0.124	6.04*	1	0.347	13.32**
Error BC	17	0.020		17	0.026	
ABC	1	0.345	13.34**	1	0.123	6.04*
Error ABC	17	0.026		17	0.020	
Total	143			143		

* $p<0.05$ ** $p<0.01$ *** $p<0.001$

5.4. Discussion

The most direct answer to the question whether the behavior is more contingent on the choices at the last trial than on the outcomes at this trial is given by the choice-outcome-conditioned propensities. The 15 sources of variance in Table 5-4 together account for 30.7% of the total variance (Winer, 1971, pp. 428-430). The significant sources A (own choice at the previous trial), B (other person's choice at

the previous trial), and the not significant interaction between these two main variables account for 28.6%. The sources of variance regarding one's own and/or the other person's outcomes at the last trial contribute almost nothing to the variance. Hence, it is shown that choice behavior in a PDG (at least in the probabilistic version) is not (solely) determined by outcomes, but (also) to a large extent by choice. It is recommendable, however, to examine the extent to which this conclusion is affected by: a) the use of a PDG instead of a MDG, b) the use of a symmetrical instead of a asymmetrical matrix.

A striking point in the analysis of the state-conditioned propensities of condition I and of the choice-conditioned propensities of condition II is the fact that the deterministic or probabilistic nature of the matrix has only a main effect on the propensities and no interaction effect with choices made by Subject and Other. For a given combination of own and other person's choice at the last trial, the probability of C-choice in the next trial is 9% lower in the probabilistic than in the deterministic version of the matrix. This may be due to the fact that a probabilistic matrix (condition II) causes more uncertainty than a deterministic matrix (condition I).

Just as there is found to be a difference in the level of the choice-conditioned propensities between conditions I and II, there is also a difference in the level of the outcome-conditioned propensities of conditions II and III. In condition III the propensities are 0.15 lower than in condition II. Here, too, one could be prone to attribute this to uncertainty.

The same applies to the percentages of C-choices. In conditions I, II and III which in this sequence show an increase in the degree of uncertainty, a decrease in the percentage of C-choices is seen in the same sequence. Also the

course of the percentage of C-choices over the trial blocks is meaningful here. In condition III one sees an almost continuous decrease over the trial blocks, while in condition II that is the case up to about 100 trials. After that, an increase occurs in condition II. In condition I the percentage of C-choices appears to gradually increase to about 69%. Here, however, the size of the trial blocks (25 trials) has an obscuring effect. When a division into trial blocks of 5 trials is made, the percentages for the first ten blocks are as follows: 53, 31, 32, 31, 38, 34, 50, 67, 58 and 71%. These percentages differ from one another ($F = 3.66$, df 9/72, $p < 0.01$). After the first pair of trials there comes a decrease with a recovery after about 30 trials. In all three conditions a lowest point appears in the C-choice percentages. In condition I this occurs after about 15 trials, in condition II at about the 100th trial. In condition III the last trial block forms the lowest percentage of C-choices. The greater the degree of uncertainty, the later a recovery in number of C-choices will appear. In condition III this recovery does not even appear.

CHAPTER 6

SOCIAL COMPARISON IN TWO-PERSON EXPERIMENTAL GAMES: A DISCUSSION

In this chapter we shall be taking a closer look at some aspects of the results of the experiments in chapters 3, 4 and 5. In the course of this study we shall also discuss a few general points relating to social comparison and experimental games.

In Chapter 3 we saw that subjects, when comparing the goals they attribute to Choosers who have chosen certain alternatives in a 9-choice decomposed game, place the greatest emphasis on the competition-martyrdom dimension. This means that, as they compare the Choosers' goals, they are chiefly influenced by the ratio of the size of the outcomes that Chooser obtains to the size of the outcomes for Other. This result is particularly striking in view of the fact that chance is of considerable importance in the hypothetical situation presented to the subjects. Firstly, the Choosers were each fortunate enough to be one of the prizewinners in their own particular state and, furthermore, the toss of a coin established that they and not the other prizewinner could choose one of the alternatives. This means that the Choosers could only consider the outcomes they obtained as "cues for their own person" to a limited extent. Nevertheless, social comparison still appears to exert considerable influence in this situation. In the structure that can be drawn up on the basis of the similarity ratings of the Choosers' goals, the major dimension is the competition dimension, and not the dimensions of individualism, cooperation or altruism.

This appears to be the case, regardless of the subject's own particular motivation. In most experiments on cognitions related to behavior in experimental games, the subject's

own motivation did appear to have some effect.

Kelley and Stahelski (1970a, b) investigated the so-called "triangle hypothesis". This hypothesis predicts that cooperative subjects engaged in PDG interactions with competitive subjects will make D-choices for defensive reasons and will thus adapt their behavior to that of the competitive antagonist. As a result of this adaption the competitive subject will tend to attribute a competitive goal to the cooperative subject. This means that a competitive person will make little distinction between the goals of competitive and cooperative people: he will attribute a competitive goal to both categories. A cooperative person, however, will differentiate between the goals of persons who are cooperatively or competitively inclined. At the start of the study the rules of the PDG were explained to the subjects. After this the subjects were asked to state which goal they would work towards during the game. The goals stated were examined to see whether they were predominantly cooperative or competitive. Each subject was then paired with another subject who was predominantly cooperatively or predominantly competitively oriented. The subjects made 30 choices in the PDG. After every ten choices they answered a number of questions concerning their perception of the other player's goal. It appears, from the results, that predominantly cooperatively inclined subjects perceive the goals of the other player rather accurately. This is not true of predominantly competitively inclined subjects. They attribute a predominantly competitive goal to both competitively and cooperatively inclined partners in the PDG.

If these findings should also apply to the real-life situation, outside the PDG, this would mean that people with a competitive orientation would perceive people in general as competitive, while cooperatively oriented individuals will be aware of a greater degree of hetero-

geneity in people's goals. On the basis of such general experiences, the subjects will not only perceive Other's goals in the manner just described, after a few PDG choices but will also have ideas about the goals and expectations about the choices of others, even before the first choice has been made. A study by Kuhlman and Wimberley (1976) showed that this was, indeed, the case, as regards the PDG. On the basis of choices made in several decomposed games (cf. chapter 3 of the present dissertation) they classified a number of undergraduates as being predominantly cooperatively, competitively or individualistically oriented. After this the subjects were asked to estimate what percentage of the undergraduates would choose each of the three alternatives in 4 decomposed games (one game from each of 4 types of game). The rules of a classic PDG were then explained to the subjects. Before making their choices in the PDG they estimated the percentages of undergraduates that would choose each of the two alternatives in the game. The estimates the subjects made for the choices in the classic PDG showed the same pattern as the results obtained by Kelley and Stahelski. The competitively oriented subjects expected the undergraduates to choose the competitive (and individualistic) alternative in 71% and the cooperative alternative in 29% of the cases. The cooperatively oriented subjects expected 47% of the undergraduates' choices to be competitive and 53% cooperative. The estimates of those classified as individualistic fall between those of the competitive and cooperative subjects: 61% competitive and 39% cooperative.

Kuhlman and Wimberley found approximately the same pattern in the results of estimates of choices in a decomposed game of the PDG-type. In other types of decomposed game, however, it appeared that the estimates reflected the subjects' own motivation. In the decomposed game in which the cooperative, individualistic and competitive motives lead to the choices of alternatives A, B and C, respectively (known as the triple

dominance game) cooperatively oriented subjects expected more A-choices, individualistic oriented more B-choices and competitively oriented more C-choices from the undergraduates.

Miller and Holmes (1975) also demonstrated that the kind of matrix employed determines whether the self-fulfilling prophesy, as formulated by the triangle hypothesis, will be borne out. They found confirmation for the triangle hypothesis in their replication of the Kelley and Stahelski study (1970a). They had, however, an extra condition in their study, in which the PDG matrix employed was extended to a third alternative, that enabled the subject to make a defensive choice without having to choose the competitive D-alternative of the PDG. In this latter condition the triangle hypothesis was apparently not borne out. Both the cooperative and the competitive subjects expected, in this condition, that the "typical person" would make the same choice as themselves in about 66% of cases.

This phenomenon, of subjects taking their own behavior as a guide to predict "what everyone does" is known as "false consensus" (Ross, Greene and House, 1977). This false consensus phenomenon in experimental games was also demonstrated by Dawes, McTavish and Shaklee (1977), using a Commons Dilemma Game and by Messé and Sivacek (1979) who used a PDG.

Since the subjects in the situation presented to them in the study in Chapter 3 did not have to predict "what everyone does" but, rather, the degree of similarity between the goals of a number of Choosers, each of whom had selected one of a number of clearly defined alternatives, one can hardly expect a false consensus phenomenon, in the sense just described. However, the essence of the false consensus phenomenon is the subject's assumption that others are the same as himself. He projects his own motivation on to others. In this sense one could expect subjects to use their own dominant motivation as

criterion for determining the similarity between the goals of the different Choosers. However, the results of the INDSCAL analysis carried out on the weights of the four groups of subjects on the two dimensions (Figure 3-3) show that this can only apply to the Competitors.

According to the triangle hypothesis the false consensus phenomenon is only seen among competitively oriented and not among cooperatively oriented persons. This latter group shows a greater discrimination in attributing opinions to others. Translated into the terms of the study in Chapter 3, this means that Cooperators employ a certain criterion less stringently than Competitors in evaluating the similarity of the Choosers' goals. A closer examination of the weights ascribed to subjects on the INDSCAL dimensions in Figure 3-3 reveals that there is little variability in the weights for the group of Competitors. All Competitors have rather heavy weights on the inequality dimension (dimension 1) and rather low weights on the equality dimension (dimension 2). The group of Cooperators on the other hand, shows more variability. Three of the Cooperators have weights which are at least as extreme as those of the Competitors. In contrast, there are also three Cooperators with lower weights on dimension 1 than the Competitors. In view of the small sample size, however, it is not possible to make statistical tests of significance. The results of the Individualists, whose weights could have been expected to be somewhat similar to those of the Competitors, and the results of the Altruists, whose weights could have been expected to be similar to those of the Cooperators do not lend themselves so readily to an interpretation in terms of the triangle hypothesis. This means that although there is some evidence in favor of the triangle hypothesis, it is rather restricted. In general, the results of the study in Chapter 3 can be considered as indicative of the social comparison phenomenon.

It would not be correct to claim that social comparison is

the only motivational force of significance for everyone and in every situation. Kelley and Thibaut (1978) report various possible transformations of a "given" interaction matrix. A "relative gain transformation", as can be expected in many situations on the basis of social comparison, is only one of the transformations possible. Kelley and Thibaut assume that transformations of the matrix can be learned:

> "These transformational tendencies are represented in the mature adult as social and personal values and as rules for good and/or successful social conduct. These values and rules may be prosocial, egoistical, or even anti-social in nature. It is reasonable to assume that because of their functional value these tendencies are acquired not only as instrumentally useful procedures and rules of thumb but also, by association with a broad spectrum of gratifications, as qualities of value themselves." (pp. 21-22).

A transformational tendency can, up to a certain point, become functionally autonomous, that is, it becomes a value in itself and one which is pursued in every situation. Empirical evidence for this has been furnished by Kuhlman and Marshello (1975a) and by Bennett and Carbonari (1976) who demonstrate that some motivational orientations correlate with certain personality characteristics. In general, the functional autonomy will be restricted. The transformational tendencies are usually learned more in conditional than in absolute terms. This means that the situation determines, to a major extent, what the most appropriate transformational tendency will be. This was expressed by McClintock (1972) in one of his propositions:

> "The environment may operate to define the availability of outcomes to own and other in such a manner as to increase or decrease the likelihood that a given motivational predisposition will be dominant" (p. 451).

McClintock describes four sorts of setting, each of which leads to a different motivational orientation. There is, for example, an individualistic setting when an individual is not in a situation of social interdependency with another or is not conscious of being so (e.g. "the minimal social

situation"). In a cooperative setting, on the other hand, the individual is conscious of interdependency with others. He is also aware that the joint outcomes of the interdependent persons are more important than, for instance, his own outcomes. This occurs on occasions as when the individual considers himself as member of a group which is comparing itself with another group. As examples of a competitive setting McClintock describes (p. 452) sport situations and the ranking of students in schools. In fact many situations in which an individual compares himself, or is compared, with another are actually competitive settings. An altruistic orientation is more likely when the outcomes for Other are perceived as relatively high in relation to the costs for the individual himself. Examples of this are a parent who forgoes winning a game with his child, or a motorist who stops to give aid to a disable motorist. A third example described by McClintock is rather dubious:

> "As we have occasionally observed in game studies, a player may begin to select alternatives that meet our definition of altruism when he has built up an enormous lead over another player."

As Rijsman and Poppe (1977, and cf. Chapter 4 of this thesis) show, the latter example can also be interpreted in terms of social comparison.

In the situation presented to the subjects in the study described in Chapter 3, recognition of one of the four motivational settings will not be easy. This means that it is difficult to determine, a priori, that a certain motivation is the most appropriate one. For this reason it is remarkable that subjects with different dominant motivational predispositions display a considerable degree of agreement in their assessments of the similarity of the Choosers' goals.

The results of the study in Chapter 4 indicate that the subjects do not introduce any systematic changes in the

functional aspects of the matrix, such as RC and FC but do introduce such changes in general aspects such as GM. The changes in GM can be interpreted quite satisfactorily in the light of the social comparison theory. The phenomenon of social comparison becomes manifest, not only in the form of competition, but also - depending on the position in relation to the Other with whom the subject is comparing himself - in the form of other motives, such as martyrdom and altruism. The fact that the changes in GM are determined to such a large extent by social comparison ties in with Thibaut and Kelley's (1959) ideas concerning the Comparison Level. As described in Chapter 1, Thibaut and Kelley consider the matrix values as being scaled along a dimension which has, as its subjective zero-point, the Comparison Level ("the standard against which the member evaluates the 'attractiveness' of the relationship"). By changing the matrix values, the subjects, in fact, change the distance to the zero-point (CL). The location of the CL is determined by the outcomes obtained by the individual in previous situations or by observing the outcomes that Others obtain. As the experimental situation in Chapter 4 was an entirely new one for the subjects, the CL in this case could not have been based on a subject's previous experience. In this study the only reference points a subject can take to evaluate his own matrix values are the matrix values of the Other with whom he is interacting.

As already explained in Chapter 2, an individual can consider his behavior, his body and his possessions as cues for his person. Clearly, in the experimental situation, the subjects will take, as cues for their own person, mainly the quantities of outcomes that can be obtained, according to the matrix values. As predicted by the social comparison theory, people generally attempt to avoid or to cancel out a deficit in GM and to achieve a slightly higher GM than the other person. When the difference in the matrix value means of the two persons is relatively large, the person in the favorable

position will reduce the difference in such a way that the mean of his own matrix values is slightly higher than that of the other person. The phrase "slightly higher than that of the other person" is actually a very vague one. The subjects in the conditions SS and SE begin with a difference in GM of 6 units to their advantage. They reduce this difference (and allow it to be reduced) to 3.75 and 3.0 units, respectively. The subjects who begin with an initial position in the matrix identical to that of Other, but who are given better possibilities of changing (condition ES) are satisfied if they manage to obtain a GM difference of 1.0 unit. The mathematical functions that Rijsman (1979b) derived from the social comparison model are, as yet, only of significance for understanding the model, as such. In order to use the derivatives as predictions for concrete situations one would have to have recourse to a form of psychophysics dealing with the experience of self as (in)equal to the Other on a certain dimension.

The study concerning the changing of the matrix is based on the type of matrix usually employed in experimental games. This is also the sort of matrix used by Thibaut and Kelley (1959) in their analysis of interpersonal interaction (cf. Chapter 1). The values in the matrix (and the outcomes) are defined as the rewards obtained by means of the interaction, minus the costs involved by the interaction. In this view of the matrix little attention is paid to a number of important factors which may affect the evaluation of outcomes obtained or to be obtained. These factors are personal characteristics such as education, intelligence, experience, training, skill, seniority, age, sex, ethnic background, social status and physical attractiveness. Homans (1961) calls the factors (in so far as they are relevant to the interaction) "investments"; Adams (1965) calls them "inputs". Incidentally, they would also classify as investments and inputs the time spent on the interaction and the efforts made, factors that Thibaut and

Kelley would classify as "costs". With regard to abilities, Thibaut and Kelley (1959, pp. 37-39) remark only that possession of these means that a person can create a high reward for the Other in the interaction, at low cost to himself.

As described in Chapter 2, an Individual (I) can consider his inputs as a cue for his person (P_I) and Other's inputs as a cue for the other person (P_O). By means of these cues I will seek to obtain a slightly superior position for P_I, in relation to P_O, on the relevant dimension. It was also stated in Chapter 2 that I wishes to see a reflection of the input ratio in the ratio of the outcomes obtained by himself and Other in the interaction, in order to have his opinion about the position of P_I relative to P_O validated, in this way. The choice of a certain behavioral alternative determines, together with the alternative that Other chooses, whether a certain comparison of inputs is possible, or is not possible, and whether the individuals involved in the interaction will obtain outcomes that reflect their inputs.

As regards the inputs, a distinction must be made between those concerning one or a few items from the behavioral repertoire and those concerning a large number of items from the behavioral repertoire. An example of the former category of inputs is found in the skills that an individual has at his disposal to use in certain actions. Examples of the latter category are the more general characteristics of the individual such as status, age, and so on. When there is no question of item-specific inputs, as in the majority of experiments with experimental games, only a comparison on general dimensions will be possible.

The results of the study in Chapter 5 are rather complex. In the condition in which subjects receive no feedback on the choices in the probabilistic matrix (condition III) the

choices appear to be correlated, in some special way, with the outcomes on the previous trial. If the subject himself has received no reward while Other has, then the subject is less inclined to repeat the previous choice than after the three other possible combinations for the preceding trial. This particular combination of outcomes is the only combination in which a subject suffers a loss in relation to the other. The fact that a subject, after a relative loss, is more inclined to change his choice can be related to Messick and Thorngate's (1967) finding that avoiding relative loss is a stronger motivational force than obtaining relative gain. This finding ties in with social comparison theory. Changing the choice to avoid relative loss makes sense when that relative loss has been incurred in a trial in which the subject made a C-choice. Changing from a C- to a D-choice will reduce the probability of relative loss. However, if the subject makes a C-choice after a D-choice the probability of relative loss will definitely not become smaller. It indicates that the subject has responded to a certain principle in rather a mechanical way. This is somewhat reminiscent of the "win-stay, lose change" principle only in this case one should interpret "lose" as relative loss and "win" as relative gain or as remaining relatively equal. Actually, it is not a matter of 100% probability that the subject will, or will not alter his choice. There is relatively more likelihood that a subject will change his choice when he has suffered a relative loss than when he has not suffered a relative loss.

If the subject is aware of Other's choices in the probabilistic matrix (condition II) his choices appear to be barely contingent on the outcomes obtained in the previous trial. In this condition the subject's choice is mainly determined by his own and Other's choice in the previous trial. From the results of the two conditions one can deduce that the information the subject receives is of a different

type in each of the two conditions. In condition III social comparison is the only possibility. The subject can compare himself with Other on the basis of the outcomes obtained from the interaction. Validation of one's evaluation of the comparison is hardly possible because the subject is unable, because of the role played by chance, to determine what exactly the Other has chosen. In condition II, however, it is possible for him to determine this. In this condition a choice made by Individual A in a PDG can be taken by the other (B) as being an attitude toward the result of the comparison of P_A and P_B on the basis of cues derived from the outcome scores. A D-choice by Individual A can be interpreted by Individual B as an attempt to alter the relative position of the outcomes to A's advantage. If the outcomes of A and B are taken as cues for P_A and P_B then a D-choice by A means that he does not validate B's opinion of the actual or realizable result of the comparison. A C-choice by A, however, can be seen by B as a validation of B's opinion of the actual or realizable result of the comparison of P_B with P_A.

Chapter 2 explains that it is difficult for two individuals to validate each other's opinion of the results of the comparison when a comparison is made on one dimension. The problem can be solved if the dimension of comparison can be split into two, mutually independent dimensions. However, this is not possible in an experimental game. Hence, in a game of this sort many D-choices are answered with D-choices. In fact a new matrix has appeared which now has validation outcomes as matrix values. This new matrix appears to be a zero-sum-game. The one individual is unable to confirm the superiority of Other's without thereby admitting his own inferiority. A possible solution is that the two individuals abandon the comparison and both make C-choices in the PDG. Since factors of uncertainty are of less importance in the deterministic matrix than in the probabilistic matrix, this

solution is found more easily in the former than in the latter.

In Chapter 1 we mentioned that there is relatively little theory in the field of experimental games. An attempt has now been made, in three studies, to investigate the explanatory value of social comparison in game situations. Although there is still uncertainty and some questions remain unanswered, it can nevertheless be concluded that the social comparison theory can prove valuable in explaining the various phenomena. Furthermore, experimental games (with the addition of some modifications, where necessary) have proved their worth as a paradigm for researching certain theoretical questions.

Summary

In this dissertation consisting of 6 chapters, the explanatory value of social comparison theory in two-person experimental games is examined. Three experiments in this field are reported in chapters 3 to 5, inclusive. These chapters are preceded by two introductory chapters dealing with the aspects of experimental games and social comparison relevant to the experiments and followed by a chapter in which some results are discussed.

Chapter 1 contains an exposition of experimental games as interpersonal choice situations. The Prisoner's Dilemma Game (PDG) is described as an example of such games which originated in game theory and were later included in social psychology. It is noted that in social psychology there is relatively little theory in relation to the host of empirical studies in the field of experimental games. An important exception is Kelley and Thibaut's (1978) "Theory of Interdependence", some essential points of which are described. The notion "fate control" in this theory is illustrated by means of the "minimal social situation". The last part of the chapter describes how the introduction of certain kinds of games (such as the Maximizing Difference Game and decomposed games) by McClintock and his collegues and students made it possible to study other motives in addition to the own gain maximization motive from game theory. These motives can be presented as vectors in a two-dimensional vector space with the outcomes of a certain choice for a person himself as one principal axis and the outcomes for another person as the other principal axis. In certain cases, however, it turns out that the motives are more descriptive than explanatory.

In chapter 2 Rijsman's (1979a, b; in press a, b) theory of social motivation is described.This theory expounds how an individual experiences himself in relation to others. This Self/Other experience is based upon processes of social

attribution, social comparison and social validation. In the process of social attribution the individual reduces variable stimuli to cues for his own person. On the basis of these cues the individual compares his own person with other persons. He shows at the same time a tendency towards being similar to others as well as a tendency towards being different from the others. This results in preferring to be just somewhat better than other persons on dimensions which are positively evaluated. The subjective opinion of an individual on the result of a comparison with an other person attains more general validity when the individual can coordinate action tendencies which are included in this opinion, with action tendencies of others. The social comparison process mentioned is described more specifically in the form of a model. Two elaborations of Rijsman's theory are described, one on equity and another on roles.

Chapter 3 examines whether, on a cognitive level, the dimension of obtaining relatively more or fewer outcomes than an other person (the competition dimension) is more important than others in the two-dimensional vector space. For this reason four groups of subjects were presented with a hypothetical situation. The subjects were classified on the basis of the Kuhlman and Marshello (1975) method and on the basis of choices in some Commons Dilemma Games as dominantly competitive, individualistic, cooperative or altruistic. According to the description of this situation nine lotteries had been organized and in each there were two prizewinners. Chance determined which of the two was allowed to make a choice out of 9 alternatives. Each of these alternatives brought a given amount of money to the Chooser and a given amount to the other winner. These amounts were determined so that (a) 8 alternatives were located each on the principal axes or diagonals of the two-dimensional vector space and (b) these 8 alternatives were situated on a circle with the ninth point as the center. According to the description in each lottery the person who was allowed to make a choice,

chose an other alternative. The selections of the Choosers were presented pairwise to the subjects, who were asked to indicate how (dis)similarly they evaluated the Choosers' goals. Indeed, an INDSCAL analysis of the data shows a structure with the alternatives ordered on the most important dimension to the degree the Chooser himself or the other prizewinner got relatively more outcomes. A second dimension is found, on which the alternatives giving the Chooser about as much as the other are located on one side and the alternatives giving one of the two persons more than the other on the other side. No differences in the weights of the four groups of subjects are found on the two dimensions.
In the same investigation the subjects were asked to evaluate the degree of relevance of certain labels with regard to the goals associated with choosing a certain alternative. On the most important dimension found in the data by means of a discriminant analysis the alternatives are located in about the same order as on the first dimension of the INDSCAL structure.

In chapter 4 an experiment is described in which the subjects, in each of 10 trials, got the opportunity to change one of the matrix entries relating to their own outcomes up to a certain maximum and, up to the same maximum, to change one of the matrix entries relating to the outcomes of the other person in the game matrix. Some of the subjects started in the superior and others in the inferior position in an asymmetrical matrix. Still other subjects started in a symmetrical matrix. Independently of this, some subjects could change the matrix entries up to a maximum of three units while others, with whom they were interacting in the matrix, could change the entries up to a maximum of one unit. Others again could change the entries up to the same maximum (2 units) as the other person in the matrix. In the matrix entries of a person Kelley and Thibaut (1978) distinguish four components, namely a general mean (GM), a component

indicating the influence a person has on his own outcomes (RC), a component indicating the influence the other person has on a person's outcomes (FC), and a component indicating the influence that both persons in combination have on the outcomes of one of them (BC).
It was predicted from social comparison theory that the subjects would change the matrix entries so as to cancel out a backlog in components GM, RC and FC and would try to gain a small lead (eventually by reducing too big a lead) in these components. These predictions are generally confirmed with regard to the GM component. It is found that the RC and FC components are changed rather unsystematically.

Chapter 5 considers whether the choices in a PDG are mainly contingent on the outcomes of the last trial or on the choices of the last trial. Taking social comparison theory as the basis one can expect more contingency on outcomes than on choices. As outcomes in a classic PDG are completely determined by choices, a so-called probabilistic version of the PDG is designed. In this version the matrix entries do not indicate the outcomes, but chances of achieving a certain outcome. In this situation in some cases a subject does and in others does not gain a reward. Receiving a reward is only partly determined by choices of the one and the other person in the matrix.
In the experiment each of 27 subject pairs made 250 choices in a classic, deterministic version or a probabilistic version of a PDG. After each trial all subjects in the deterministic and some in the probabilistic PDG receive feedback on the choice made by the other person in that trial. Other subjects did not receive feedback on the choice made by the other subject. After each trial all subjects received feedback on the scores and total scores of both persons. The results show that if a subject does not know the choice of the other person, his own choices are contingent on the outcomes in the last trial in a specific

way. The subjects tend to alter their choice if they themselves did not and the other did receive a reward in the last trial. This is especially the case after a C-choice, but to a lesser extent also after a D-choice. If, after each trial a subject receives feedback on the choice the other person made then his choices are mainly contingent on those of the two persons in the last trial.

In chapter 6 the discussion of the results of the experiments is continued. With regard to the results of chapter 3 it is noted that they do not show the so-called "false consensus" phenomenon and give but indications in the direction of verification of the "triangle hypothesis". The changes in the GM component of the matrix are related to Thibaut and Kelley's (1959) "Comparison Level" notion. With regard to the way Thibaut and Kelley conceive a matrix, it is noted that they neglect the importance of the "inputs" of an individual in an interaction. The results of the experiment dealt with in chapter 5 are related to social validation.

Samenvatting

In dit proefschrift, dat uit 6 hoofdstukken bestaat, wordt de verklarende waarde van de sociale vergelijkingstheorie in experimental games onderzocht. In de hoofdstukken 3 t/m 5 worden hierover drie experimenten gerapporteerd. Deze hoofdstukken worden voorafgegaan door twee inleidende hoofdstukken waarin voor de experimenten relevante aspecten van experimental games en sociale vergelijking beschreven worden en gevolgd door een hoofdstuk waarin sommige onderzoeksresultaten worden bediscussieerd.

Hoofdstuk 1 bevat een uiteenzetting over experimental games als interpersoonlijke keuzesituaties. Als voorbeeld van dergelijke games, die oorspronkelijk ontstaan zijn in de Speltheorie en later in de sociale psychologie zijn bestudeerd, wordt het Prisoner's Dilemma Game (PDG) beschreven. Er is opgemerkt dat er in de sociale psychologie betrekkelijk weinig theorie is in verhouding tot de grote hoeveelheid empirische studies op het gebied van experimental games. Een belangrijke uitzondering hierop vormt Kelley en Thibaut's (1978) "Theory of Interdependence", waarvan enkele essentiële punten worden beschreven. Het begrip "fate control" uit deze theorie wordt toegelicht aan de hand van de zogenaamde "minimale sociale situatie". In het laatste deel van het hoofdstuk wordt beschreven hoe de introductie van bepaalde soorten games (zoals het Maximizing Difference Game en decomposed games) door McClintock en zijn collega's en studenten het mogelijk maakte, behalve het eigen winstmaximalisatie motief uit de Speltheorie, ook andere motieven in experimental games te bestuderen. Deze motieven kunnen worden voorgesteld als vectoren in een twee-dimensionele vectorruimte, met de opbrengsten van een bepaalde keuze voor een persoon zelf als de ene hoofdas en de opbrengsten voor een Andere persoon als de andere hoofdas. In bepaalde gevallen blijken de motieven echter meer een beschrijvende dan een verklarende betekenis te hebben.

In hoofdstuk 2 wordt Rijsman's (1979a, b; in press a, b) sociale motivatie-theorie beschreven. In deze theorie wordt de wijze uiteengezet waarop een individu zichzelf in relatie tot anderen ervaart. Deze Zelf/Ander ervaring berust op processen van sociale attributitie, sociale vergelijking en sociale validatie. In het proces van sociale attributie reduceert het individu variabele stimuli tot tekens van zijn eigen persoon. Op basis van deze tekens vergelijkt het individu zijn eigen persoon met Anderen, waarbij zowel een tendens naar gelijkheid met de andere personen als een tendens om van deze personen te verschillen, een rol spelen. Dit resulteert in juist-iets-beter willen zijn op positief gewaardeerde persoonsdimensies dan andere personen. Het subjectieve oordeel van een Individu over het resultaat van de vergelijking met een vergelijkingspersoon, krijgt meer algemene geldigheid wanneer het Individu actietendenties die in het oordeel zijn vervat, met actietendenties van Anderen kan coördineren. Het sociale vergelijkingsproces uit deze theorie is meer specifiek in modelvorm weergegeven. Twee uitwerkingen van Rijsman's theorie zijn beschreven, één over billijkheid en de andere over rolverdeling.

In hoofdstuk 3 is nagegaan of de dimensie van relatief meer versus minder opbrengsten dan een ander verkrijgen (de competitiedimensie) op cognitief vlak belangrijker is dan andere dimensies in de tweedimensionele vectorruimte van motieven. Hiertoe werd aan vier groepen proefpersonen, die op basis van een classificatiemethode van Kuhlman en Marshello (1975) en op basis van keuzen in enige Commons Dilemma Games als overwegend competitief, individualistisch, coöperatief of altruistisch waren geclassificeerd, een hypothetische situatie voorgelegd. Volgens de beschrijving van deze situatie waren er 9 loterijen gehouden en waren er in iedere loterij twee prijswinnaars. Door het lot werd bepaald wie van deze twee winnaars een keuze mocht maken uit 9 alternatieven. Ieder van deze alternatieven leverde een bepaalde som geld op voor de

kiezer en een bepaalde som geld op voor de andere winnaar. Deze sommen geld waren zó bepaald dat a) 8 alternatieven ieder op één van de hoofdassen of diagonalen van de tweedimensionele vectorruimte gelokaliseerd waren en b) deze 8 alternatieven op een cirkel lagen met het negende punt als middelpunt. Volgens de beschrijving koos in iedere loterij degene die de keuze mocht maken een ander alternatief. De proefpersonen kregen de keuzen van de prijswinnaars paarsgewijs aangeboden. Hen werd gevraagd, aan te geven hoe (on-) gelijk zij de doeleinden (goals) van de Kiezers vonden. Een INDSCAL-analyse van de gegevens levert inderdaad een structuur op met op de belangrijkste dimensie de alternatieven geordend in de mate waarin de Kiezer zelf of de andere prijswinnaar relatief meer opbrengsten krijgt. Er wordt tevens een tweede dimensie gevonden waarop aan de ene kant de alternatieven liggen volgens welke de Kiezer en de andere prijswinnaar ongeveer evenveel krijgen en aan de andere kant de alternatieven liggen die voor één van beide personen meer opleveren dan voor de ander. Er zijn geen verschillen gevonden in de gewichten van de vier groepen proefpersonen op de twee dimensies.
In hetzelfde onderzoek werden proefpersonen gevraagd om de mate van relevantie van bepaalde labels voor de doeleinden die met de keuze van een bepaald alternatief worden geassocieerd, te scoren. Op de belangrijkste dimensie, die met behulp van discriminant analyse in deze data wordt gevonden, liggen de alternatieven in ongeveer dezelfde volgorde als op de eerste dimensie van de INDSCAL structuur.

In hoofdstuk 4 wordt een experiment beschreven waarin proefpersonen de mogelijkheid kregen om gedurende tien beurten telkens één van de matrixwaarden die op hun eigen opbrengsten betrekking hadden en één van de matrixwaarden die op de opbrengsten van de andere persoon in een game-matrix betrekking hadden, met een bepaald maximum aantal eenheden te veranderen. Sommige proefpersonen begonnen met een superieure

en andere met een inferieure positie in een asymmetrische matrix. Weer andere proefpersonen begonnen in een symmetrische matrix. Onafhankelijk hiervan konden sommige proefpersonen de matrixwaarden met maximaal drie eenheden veranderen, terwijl de anderen, met wie zij in de matrix interacteerden, de waarden met maximaal één eenheid konden veranderen. Weer andere proefpersonen konden de waarden met evenveel (maximaal twee) eenheden veranderen als de andere persoon in de matrix. Kelley en Thibaut (1978) beschrijven dat de matrixwaarden voor een persoon zijn samengesteld uit vier componenten, namelijk een algemeen gemiddelde (GM), een component die de invloed aangeeft die een persoon zelf op zijn eigen opbrengsten heeft (RC), een component die de invloed aangeeft die de andere persoon heeft op de opbrengsten van een persoon (FC) en een component die de invloed aangeeft die beide personen in combinatie hebben op de opbrengsten van één van hen (BC). Op basis van de sociale vergelijkingstheorie wordt voorspeld, dat de proefpersonen de matrixwaarden zó zouden veranderen, dat zij een achterstand in de componenten GM, RC en FC zouden elimineren en een matige voorsprong zouden trachten te verkrijgen in deze drie componenten (eventueel door een reductie van een te grote voorsprong). Deze voorspellingen zijn voor de GM-component in het algemeen bevestigd. De RC- en FC-componenten blijken op weinig systematische wijze veranderd te worden.

In hoofdstuk 5 wordt nagegaan of de keuzen van proefpersonen in een PDG vooral contingent zijn met de opbrengsten die de personen in de vorige beurt verkregen of vooral contingent zijn met de keuzen die de personen in de vorige beurt gemaakt hebben. Op basis van de sociale vergelijkingstheorie kan men meer contingentie met opbrengsten dan met keuzen verwachten. Omdat in de klassieke vorm van het PDG de opbrengsten volledig door de keuzen bepaald zijn, is een zogenaamde probabilistische versie van het PDG ontworpen. In deze versie geven de matrixwaarden geen opbrengsten aan,

maar de kansen dat men een bepaalde opbrengst behaalt. In deze situatie behaalt een proefpersoon in sommige keuzen wel en in andere geen beloning. Of hij een beloning ontvangt, wordt slechts gedeeltelijk door zijn eigen keuzen en door die van de andere persoon in de matrix bepaald. In het experiment maakten 27 paren proefpersonen ieder 250 keuzen: in een klassiek deterministisch PDG of een probabilistisch PDG. Alle proefpersonen in het deterministisch en sommige proefpersonen in het probabilistisch PDG kregen na iedere beurt informatie over de keuze van de andere persoon in die beurt. Aan andere proefpersonen werd de informatie over de keuze van de ander niet meegedeeld. Alle proefpersonen kregen feedback over de scores en over de totale scorestanden van beide personen na iedere beurt. Uit de resultaten blijkt, dat als de proefpersonen niet de keuze van de andere persoon kennen, hun eigen keuzen op een speciale manier contingent zijn met de opbrengsten die in de vorige beurt behaald zijn. De proefpersonen zijn meer geneigd hun keuze te veranderen als zij zelf geen beloning hadden ontvangen en de ander wel een beloning had ontvangen in de vorige beurt. Dit geldt vooral na een C-keuze, maar in mindere mate ook voor een D-keuze. Als de proefpersoon na iedere beurt de keuze van de andere persoon meegedeeld wordt, dan zijn de keuzen vooral contingent met de keuzen van de twee personen in de vorige beurt.

In hoofdstuk 6 worden de resultaten van de experimenten verder bediscussieerd, Met betrekking tot de resultaten van hoofdstuk 3 wordt opgemerkt, dat ze niet op een zogenaamd "false consensus" verschijnsel wijzen en slechts in geringe mate de triangle-hypothese ondersteunen. De veranderingen van de GM-component van de matrix worden in verband gebracht met het begrip "Comparison Level" van Thibaut en Kelley (1959). Met betrekking tot de wijze waarop Thibaut en Kelley een matrix opvatten, wordt opgemerkt, dat zij de rol van "inputs" van een individu in een interactie verwaarlozen. De resultaten van het experiment van hoofdstuk 5 worden in verband gebracht met sociale validatie.

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Appendix 1. Commons Dilemmas used in chapter 3.

Dilemma		O	X
A	to me	$ 2.00	$ 8.00
	to others	$ 0.00	-$ 2.00*
B	to me	$ 1.00	$ 7.00
	to others	$ 0.25	-$ 1.75*
C	to me	$ 0.40	$ 6.40
	to others	$ 0.40	-$ 1.60*
D	to me	$ 0.00	$ 6.00
	to others	$ 0.50	-$ 1.50*
E	to me	-$ 6.00*	$ 0.00
	to others	$ 2.00	$ 0.00

* Negative payments were truncated to $ 0.00.

Example Dilemma A

Number Choosing X	Payment to X Chooser	Payment to O Chooser	Number Choosing O
5	$ 0.00	------	0
4	$ 2.00	-$ 6.00	1
3	$ 4.00	-$ 4.00	2
2	$ 6.00	-$ 2.00	3
1	$ 8.00	$ 0.00	4
0	------	$ 2.00	5

If e.g. there are 2 X-Choosers and 3 O-Choosers, each of the X-Choosers obtains $ 6.00 and each of the O-Choosers obtains -$ 4.00.

Appendix 2. Classification games.

Game	A	B	C	Own	Joint	Relative	Alter	Type
1 Units to ME	90	70	60	A	A	A	B or C	ORJ
Units to OTHER	10	20	20					
2 Units to ME	70	60	40	A	A	B	B	OJ.R
Units to OTHER	60	40	30					
3 Units to ME	50	40	40	A	C	B	C	O.R.J
Units to OTHER	20	0	40					
4 Units to ME	50	40	20	A	B	A	B	OR.J
Units to OTHER	10	30	0					
5 Units to ME	60	70	60	B	A	C	A	O.R.J
Units to OTHER	60	40	20					
6 Units to ME	20	50	40	B	B	C	B	OJ.R
Units to OTHER	10	40	20					
7 Units to ME	40	70	60	B	C	B	C	OR.J
Units to OTHER	20	30	50					
8 Units to ME	20	60	40	B	B	B	A	ORJ
Units to OTHER	20	0	10					
9 Units to ME	50	50	60	C	B	A	B	O.R.J
Units to OTHER	10	50	30					
10 Units to ME	50	40	70	C	C	C	B	ORJ
Units to OTHER	10	30	20					
11 Units to ME	70	50	80	C	A	C	A	OR.J
Units to OTHER	60	30	40					
12 Units to ME	70	50	80	C	C	A	C	OJ.R
Units to OTHER	50	40	70					

Appendix 3. Standardised discriminant function coefficients.

	Analysis I	Analysis II
Aggressive	-0.495	-0.507
Martyr-like	0.127	0.093
Individualistic	-0.009	0.007
Sadomasochistic	-0.060	-0.080
Altruistic	-0.011	-0.023
Competitive	-0.156	-0.022
Masochistic	0.008	0.126
Cooperative	0.140	-0.067
Self-sacrifying	0.018	0.280
Sadistic	0.046	-0.031
Selfish	-0.218	-0.200
Equalitarian	0.124	0.010

Appendix 4A. ANOVAs of change scores of conditions II, EI and SI

	GM				RC				FC'			
	SS	df	MS	F-ratio	SS	df	MS	F-ratio	SS	df	MS	F-ratio
A = starting-position	0.018	2	0.009	0.253	1.163	2	0.582	1.804	0.790	2	0.395	0.700
Error between	0.935	27	0.035		8.705	27	0.322		15.245	27	0.565	
B = trials	0.186	9	0.021	1.624	2.518	9	0.280	1.399	0.752	9	0.084	0.400
A x B	0.193	18	0.011	0.843	4.812	18	0.267	1.337	2.368	18	0.132	0.631
B x subj.w.gr.	3.090	243	0.013		48.595	243	0.200		50.705	243	0.209	
C = Self/Other	15.360	1	15.360	90.873***	0.602	1	0.602	2.006	0.015	1	0.015	0.035
A x C	0.558	2	0.279	1.649	0.373	2	0.187	0.622	0.030	2	0.015	0.035
C x subj.w.gr.	4.564	27	0.169		8.100	27	0.300		11.430	27	0.423	
B x C	0.534	9	0.059	1.992*	2.040	9	0.227	1.037	1.360	9	0.151	0.895
A x B x C	0.499	18	0.028	0.930	3.785	18	0.210	0.962	4.145	18	0.230	1.364
B x C x subj.w.gr.	7.236	243	0.030		53.100	243	0.219		41.020	243	0.169	
Total	33.171	599			133.793	599			127.860	599		

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Appendix 4B. ANOVAs of change scores of conditions IE and EE

	GM				RC				FC'			
	SS	df	MS	F-ratio	SS	df	MS	F-ratio	SS	df	MS	F-ratio
A = starting-position	0.017	1	0.017	0.184	2.933	1	2.933	4.643*	0.170	1	0.170	0.378
Error between	1.687	18	0.094		11.369	18	0.632		8.107	18	0.450	
B = trials	0.652	9	0.073	1.327	6.094	9	0.677	1.523	7.075	9	0.786	1.338
A x B	0.432	9	0.048	0.878	5.500	9	0.611	1.375	7.169	9	0.797	1.355
B x subj.w.gr.	8.851	162	0.055		72.009	162	0.444		95.209	162	0.588	
C = Self/Other	20.194	1	20.194	34.807***	0.004	1	0.004	0.009	0.098	1	0.098	0.155
A x C	0.186	1	0.186	0.321	0.098	1	0.098	0.225	2.364	1	2.364	3.743
C x subj.w.gr.	10.443	18	0.581		7.827	18	0.435		11.367	18	0.631	
B x C	1.502	9	0.166	2.042*	3.741	9	0.416	1.009	3.779	9	0.420	1.041
A x B x C	0.819	9	0.091	1.114	3.760	9	0.418	1.014	3.225	9	0.358	0.889
B x C x subj.w.gr.	13.239	162	0.082		66.727	162	0.412		65.324	162	0.403	
Total	58.022	399			180.061	399			203.886	399		

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Appendix 4C. ANOVAs of change scores of conditions IE and SE

	GM				RC				FC'			
	SS	df	MS	F-ratio	SS	df	MS	F-ratio	SS	df	MS	F-ratio
Between dyads	2.143	9	0.238		9.210	9	1.023		9.685	9	1.076	
A = starting-position	0.141	1	0.141	0.604	1.323	1	1.323	1.581	0.202	1	0.202	0.252
A x subj.w.groups	2.094	9	0.233		7.528	9	0.836		7.222	9	0.802	
B = trials	0.231	9	0.026	0.420	5.148	9	0.572	0.976	6.998	9	0.778	0.931
B x subj.w.groups	4.948	81	0.061		47.452	81	0.586		67.628	81	0.835	
C = Self/Other	11.391	1	11.391	9.057 *	0.722	1	0.722	1.436	0.302	1	0.302	0.344
Cx subj.w.groups	11.319	9	1.258		4.528	9	0.503		7.922	9	0.880	
A x B	1.300	9	0.144	2.433 *	4.215	9	0.468	0.813	8.185	9	0.909	1.272
A x B x subj.w.gr.	4.809	81	0.059		46.685	81	0.576		57.890	81	0.715	
A x C	2.402	1	2.402	12.622 **	0.160	1	0.160	0.156	0.040	1	0.040	0.066
A x C x subj.w.gr.	1.713	9	0.190		9.240	9	1.027		5.485	9	0.609	
B x C	1.106	9	0.123	1.142	2.590	9	0.288	0.500	3.510	9	0.390	0.810
B x C x subj.w.gr.	8.716	81	0.108		46.660	81	0.576		39.015	81	0.482	
A x B x C	3.344	9	0.372	2.336 *	4.102	9	0.456	0.671	1.272	9	0.141	0.225
A x B x C x subj.w. gr.	12.884	81	0.159		54.998	81	0.679		50.952	81	0.629	
Total	68.540	399			244.560	399			266.310	399		

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Appendix 4D. ANOVAs of change scores of conditions EE and SE

	GM				RC				FC'			
	SS	df	MS	F-ratio	SS	df	MS	F-ratio	SS	df	MS	F-ratio
A = starting-position	0.059	1	0.059	0.250	0.406	1	0.406	0.847	2.364	1	2.364	4.052
Error between	4.281	18	0.238		8.634	18	0.480		10.502	18	0.583	
B = trials	0.265	9	0.029	0.568	7.189	9	0.799	1.524	3.633	9	0.404	0.627
A x B	0.444	9	0.049	0.952	1.645	9	0.183	0.349	3.481	9	0.387	0.601
B x subj.w.gr.	8.395	162	0.052		84.894	162	0.524		104.264	162	0.644	
C = Self/Other	8.666	1	8.666	10.805 **	1.351	1	1.351	2.267	0.975	1	0.975	2.230
A x C	1.252	1	1.252	1.561	0.620	1	0.620	1.040	0.056	1	0.057	0.129
C x subj.w.gr.	14.437	18	0.802		10.731	18	0.596		7.872	18	0.437	
B x C	2.391	9	0.266	2.657 **	1.962	9	0.218	0.541	7.183	9	0.798	1.884
A x B x C	1.255	9	0.139	1.395	2.919	9	0.324	0.804	2.701	9	0.300	0.709
B x C x subj.w.gr.	16.195	162	0.100		65.322	162	0.403		68.619	162	0.424	
Total	57.640	399			185.675	399			211.650	399		

* $p<0.05$ ** $p<0.01$ *** $p<0.001$

Appendix 4E. ANOVAs of change scores of conditions IS, ES and SS

	GM				RC				FC'			
	SS	df	MS	F-ratio	SS	df	MS	F-ratio	SS	df	MS	F-ratio
A = starting-position	1.333	2	0.667	2.170	0.063	2	0.032	0.065	1.003	2	0.502	0.394
Error between	8.296	27	0.307		13.120	27	0.486		34.395	27	1.274	
B = trials	0.459	9	0.051	0.411	13.883	9	1.543	1.653	17.198	9	1.911	1.978 *
A x B	2.181	18	0.121	0.978	11.162	18	0.620	0.665	19.272	18	1.071	1.108
B x subj.w.gr.	30.104	243	0.124		226.730	243	0.933		234.805	243	0.966	
C = Self/Other	30.150	1	30.150	37.793 ***	0.027	1	0.027	0.041	0.042	1	0.042	0.047
A x C	9.916	2	4.958	6.215 **	0.653	2	0.327	0.503	5.103	2	2.552	2.897
C x subj.w.gr.	21.540	27	0.798		17.545	27	0.650		23.780	27	0.881	
B x C	0.998	9	0.111	0.632	3.982	9	0.442	0.480	4.067	9	0.452	0.442
A x B x C	5.636	18	0.313	1.785 *	17.388	18	0.966	1.048	14.588	18	0.810	0.793
B x C x subj.w.gr.	42.635	243	0.175		223.905	243	0.921		248.420	243	1.022	
Total	153.248	599			528.458	599			602.673	599		

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Appendix 5A. Changes in GM of Self and Other, by starting-position, by trial. Conditions of superior possibility to change the matrix.

Starting-position		trials										Mean
		1	2	3	4	5	6	7	8	9	10	
Inferior	Self	0.525*	0.300	0.450	0.450	0.475	0.550	0.475	0.600	0.350	0.400	0.457
	Other	-0.375	-0.225	-0.275	-0.275	-0.400	-0.475	-0.375	-0.525	-0.400	-0.050	-0.337
	Mean	0.075	0.038	0.088	0.088	0.038	0.038	0.050	0.038	-0.025	0.175	0.060
Equal	Self	0.400	0.475	0.325	0.425	0.425	0.350	0.325	0.225	0.225	0.275	0.345
	Other	-0.125	-0.100	-0.175	0.225	0.050	-0.075	0.100	0.075	0.025	-0.250	-0.025
	Mean	0.138	0.188	0.075	0.325	0.238	0.138	0.213	0.150	0.125	0.013	0.160
Superior	Self	0.200	-0.050	0.375	0.225	0.400	0.125	0.325	0.175	0.350	0.375	0.250
	Other	0.225	0.350	0.125	-0.075	0.100	0.050	-0.150	0.225	-0.025	-0.125	0.070
	Mean	0.213	0.150	0.250	0.075	0.250	0.088	0.088	0.200	0.163	0.125	0.160

* scores between -0.750 and 0.750

Appendix 5B. Changes in GM of Self and Other, by starting-position, by trial. Conditions of equal possibility to change the matrix.

Starting-position		trials										Mean
		1	2	3	4	5	6	7	8	9	10	
Inferior	Self	0.350*	0.275	0.450	0.450	0.225	0.250	0.350	0.325	0.050	0.250	0.298
	Other	-0.200	-0.300	-0.400	-0.225	-0.025	-0.175	-0.025	-0.250	-0.250	-0.100	-0.195
	Mean	0.075	-0.012	0.025	0.113	0.100	0.037	0.163	0.037	-0.100	0.075	0.051
Equal	Self	0.237	0.300	0.287	0.262	0.250	0.250	0.337	0.300	0.300	0.150	0.267
	Other	-0.038	-0.175	-0.263	-0.075	-0.075	-0.087	-0.225	-0.225	-0.187	-0.038	-0.139
	Mean	0.100	0.062	0.012	0.094	0.087	0.081	0.056	0.037	0.056	0.056	0.064
Superior	Self	0.050	0.025	0.225	0.100	0.225	0.075	0.325	0.250	0.400	0.125	0.180
	Other	0.150	0.200	0.025	0.125	-0.175	0.000	-0.300	0.050	-0.050	-0.050	-0.002
	Mean	0.100	0.113	0.125	0.113	0.025	0.038	0.013	0.150	0.175	0.038	0.089

* scores between -0.500 and 0.500

Appendix 5C. Changes in GM of Self and Other, by starting-position, by trial. Conditions of inferior possibility to change the matrix.

Starting-position		trials										Mean
		1	2	3	4	5	6	7	8	9	10	
Inferior	Self	0.200*	0.250	0.200	0.250	0.250	0.250	0.200	0.175	0.250	0.225	0.225
	Other	-0.175	-0.200	-0.075	-0.200	-0.200	-0.250	-0.150	-0.200	-0.150	-0.200	-0.180
	Mean	0.012	0.025	0.063	0.025	0.025	0.000	0.025	-0.012	0.050	0.012	0.023
Equal	Self	0.125	0.150	0.150	0.250	0.125	0.100	0.200	0.200	0.200	0.200	0.170
	Other	-0.025	-0.025	-0.075	-0.150	-0.150	-0.150	-0.100	-0.150	-0.150	-0.225	-0.120
	Mean	0.050	0.063	0.037	0.050	-0.012	-0.025	0.050	0.025	0.025	-0.012	0.025
Superior	Self	0.100	0.100	0.125	0.125	0.250	0.175	0.175	0.200	0.200	0.225	0.168
	Other	-0.050	-0.075	-0.100	0.000	-0.125	-0.175	-0.050	-0.125	-0.075	-0.200	-0.097
	Mean	0.025	0.012	0.013	0.063	0.063	0.000	0.063	0.037	0.063	0.012	0.023

* scores between -0.250 and 0.250